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• ANNUAL REPORT 1964

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ZOOLOGICAL SOCIETY

NEW YORK ZOOLOGICAL SOCIETY

SIXTY-NINTH ANNUAL REPORT

1964

THE SOCIETY'S OFFICES
630 FIFTH AVENUE, NEW YORK 10020

THE ZOOLOGICAL PARK
BRONX PARK, BRONX 10460

THE AQUARIUM
CONEY ISLAND, BROOKLYN 11224

Recipients of the Gold Medal of the New York Zoological Society

FREDERIC C. WALCOTT
Humanitarian, conservationist, vigilant defender of the living things of this earth. January 8, 1946.

RACHEL CARSON
Interpreter of the oceans. January 15, 1953.

ROBERT M. YERKES
Eminent pioneer in Psychobiology. January 26, 1954.

KONRAD LORENZ
Eminent interpreter of the behavior of animals. January 25, 1955.

JACQUES-YVES COUSTEAU
For your inspired accomplishments in advancing knowledge of life within the oceans. January 7, 1960.

ROGER TORY PETERSON
Inspired interpreter of birds for the benefit of man. January 9, 1961.

BERNHARD GRZIMEK
For the outstanding leadership of Bernhard and his son Michael in wildlife protection. January 10, 1963.

THE ZOOLOGICAL SOCIETY IN 1964

Fairfield Osborn, *President*

The biggest blizzard of the winter 1963-64 occurred the day before the Annual Members' Meeting on January 14. Despite severe traffic difficulties, the Grand Ballroom of the Waldorf-Astoria, with a seating capacity of approximately 2,000, was overcrowded, indicating somewhat to our dismay that even larger quarters would need to be found for future meetings.

This episode, evidencing the enthusiasm of our steadily growing membership, was a good augury for 1964, which will stand out as one of the most progressive in the Society's history. It may be recalled here that the first meeting of members was held in 1898 in the Grand Ballroom of the old Waldorf-Astoria, on 34th Street. That meeting was attended by about a hundred founding members. Little could they have envisioned what has since occurred in the growth of our institution!

This summary of the year's events will touch first upon one of the Society's least widely known fields of activity—scientific research. Two highly important developments have occurred:

Laboratories of Marine Sciences

Final plans have now been made for the laboratories that will be housed in a building adjacent to the Aquarium. Construction will start early in the coming year. Principal financial support has come from the National Science Foundation, the Health Research Council of the City of New York, the New York Foundation, members of the family of Mrs. Alan M. Scaife of Pittsburgh, and other individual donors. Additionally, a grant of $150,000 has been received from the Rockefeller Foundation, to be used for the acquisition of scientific equipment and the advancement of research. The research programs will be devoted to problems of marine organic life, marine production potentials, the effect of pollution upon marine organisms, the pathology of marine animals and related subjects. Special effort will focus upon marine biochemistry. Broadly speaking, this last-mentioned field of inquiry is still in a pioneering stage. It is now becoming recognized that biochemical products from marine life can be of extraordinary value in resolving various human health problems. Current research programs are largely supported by the John A. Hartford Foundation, and a detailed report concerning them, as well as a description of the future work to be carried out in the new laboratories, will be found on page 54 as presented by the Director of the Laboratories, Dr. Ross F. Nigrelli.

Department of Behavioral Sciences

Another significant development of the Society's scientific work is reflected in the plans that have now been completed, after some two years of preliminary study, for the establishment of a Department of Behavioral Sciences which will commence its work on July 1, 1965. The Director of this new Department will be Dr. Donald R. Griffin, presently Chairman of the Department of Biology at Harvard University.

A highly promising arrangement was concluded with the Rockefeller Institute at the year's end. The institute will join with the Society, through a mutual working agreement, in the advancement of research in this important field of scientific inquiry. Dr. Griffin is being appointed to a Professorship at the Institute in order that cooperation between it and the Society may be realized as fully as possible.

Tropical Research Department

There is a substantial increase of activities in field research at the Society's Tropical Research Station in Trinidad. The research station, known as "Simla," was originally established a number of years ago by the late William Beebe, for many years Director of the Department. His vision in the selection of this location as a tropical research center has been justified many times over, as shown by the ever-increasing number of applicants, both from this country and abroad, who desire to carry out their studies there. A detailed report by Director Jocelyn Crane will be found on page 64.

Wide-Ranging Research

The Society is sponsoring or financing other studies, including research on the ecology of the elephant in Uganda, conducted by Dr. Irven O. Buss of Washington State University; on the metabolism of Antarctic marine mammals by Dr. Carleton Ray and other research associates in the Weddell Sea and at the Aquarium, financed by the National Science Foundation; and studies of the populations and migrations of five species of seal in the Gulf of St. Lawrence, directed by McGill University.

Wildlife Protection

An increasing number of helpful and generous contributions for wildlife preservation, many designated for the recently established African Wildlife Fund, have enabled the Society to accelerate its work in wildlife protection. Much of this is being directed to the critical situation existing in the three major countries of East Africa—Tanganyika, now known as Tanzania; Kenya and Uganda. Actions taken during the year are as follows:

An appropriation of $110,000, payable over a three-year period, 1964-1966, has been made for the establishment and development of the new Ruaha National Park in southern Tanzania. The Central Government of this country has presented a large area of approximately 5,000 square miles for the new Park and the local African District Councils are taking a cooperative and lively interest in the program. The region as a whole is rich in both mammalian and avian fauna.

Funds have been approved for the acquisition of three Piper airplanes for use by the National Park systems of Tanzania, Kenya and Uganda, each plane costing approximately $13,000. This equipment is invaluable for the control of poaching as well as for aerial observations of animal life, including migration patterns of game animals, all of which contributes greatly to improved results in wildlife management.

A series of educational programs aimed at increasing the understanding of the African people of the values of wildlife and its protection have been carried out under the direction of William Eddy, and in cooperation with the African Wildlife Leadership Foundation, four educational films with Swahili commentary have now been completed and are being widely distributed in schools and communities in Tanzania, Uganda and Kenya. Two grants of $10,000 each have also been made for the establishment of educational centers, known as "informative zoos," one located adjacent to the Nairobi National Park and the other at Entebbe, Uganda.

In addition to its conservation work in Africa, action has been taken by the Society to aid in the protection of wildlife on the Galapagos Islands. A grant of $10,500, payable over a three-year period, has been made, through the Charles Darwin Research Foundation, to cover the costs of a Warden for the purpose of preventing poaching and freeing certain islands of introduced predators.

A grant of $2,000 was made to the Survival Service Commission, affiliated with the International Union for Conservation of Nature and Natural Resources, to aid in meeting the publication costs of the so-called "Redbook" of threatened species of animal life in various parts of the world.

For several years the Society has encouraged, sponsored and extended financial support to the establishment of the Exuma Cays Marine National Park in the Bahamas. Recently an organization known as the Bahama National Trust has been established to take charge of the development and administration of this marine park, one of the first of its kind. The Society intends to continue aid to this new organization.

Mr. Conway, Director of the Zoological Park, and myself attended a meeting of international zoological parks and related organizations held under sponsorship of the I.U.C.N. in London in June. The principal objective of this conference was to activate the role that zoological parks throughout the world can play in wildlife protection. During these conferences it was brought to light that a major drain upon primate populations in Asia, Africa and South America was resulting from the extensive importations being made to this country by primate research centers. A plan has been formulated for a conference to be attended by representatives of primate research centers, together with representatives of Federal agencies that are financing them, and representatives of other interested organizations, to be held at the New York Zoological Park early in the coming year, under the sponsorship of the Zoological Society and the I.U.C.N.

ZOOLOGICAL PARK AND AQUARIUM

Detailed reports concerning the Zoological Park and the Aquarium will be found elsewhere—that of Mr. William Conway, Director of the Zoological Park, on page 10, and that of Mr. Paul Montreuil, Director of the Aquarium, on page 42.

Both the Zoological Park and the Aquarium are engaged in extensive development programs. At the Zoological Park, plans are being made for a series of new buildings and exhibits that will cost in excess of $4,000,000.

Similarly, extensive plans are under way for major additions to the exhibits at the Aquarium, at an estimated cost of $2,500,000.

It is gratifying to report that the city has shown warm interest in these forward-looking plans, and preliminary endorsements have been received from the Department of Parks and the City Planning Commission.

The Aquatic Bird House, opened in September, has proved a brilliant success. It is a tribute to the skill of Director Conway and the staff members involved in its creation. It also reveals the extraordinary value of new techniques that have been developed in exhibition methods, and gives an intimation of the success the Society may expect in making both the Zoological Park and the Aquarium preeminent among institutions of their kind.

Membership

The constant increase in the Society's members is most heartening. At the year's end there were 5,126 members, a new high.

General Development Fund

Another source of high encouragement is the success of the General Development Fund campaign. An additional $2,014,000 was received in cash and pledges during the year so that the campaign total now stands at $7,072,000, well on the way towards the campaign goal of $10,000,000. These new funds come from a variety of sources, including gifts and legacies from individuals and grants from foundations as well as from governmental agencies. Many of these gifts are unrestricted as to the purpose for which they may be used, others specify a purpose in which the donor, whether individual or foundation, is particularly interested. All fortify the Society in carrying forward its work.

Trustees

During the year the Society suffered a sad loss through the deaths of three trustees—Dr. A. Raymond Dochez, Mr. Harold J. O'Connell and Mr. Landon K. Thorne. All these Board Members were, during the many years of their trusteeship, of extraordinary value in the affairs and progress of the Society. They will be greatly missed.

Mr. Landon K. Thorne, Jr., has been elected a Member of the Board, Class of 1965.

Mr. John Elliott, Trustee of the Class of 1967, has been elected Secretary of the Society.

Staff

After 37 years of devoted and highly capable service, Mr. Christopher W. Coates retired as Director of the Aquarium, being succeeded in this position by Mr. Paul Montreuil.

Other appointments were: Mr. Harold C. Palmer, Assistant Secretary of the Society; Dr. Carleton Ray, Curator of the Aquarium; Mr. Herbert Knobloch, Curator of Education; and Mr. John McKew, Personnel Manager & Assistant to the Director of the Zoological Park.

* * *

These are propitious times for our institution. With the increase of mechanization and urbanization, great numbers of people in every walk of life feel the need to maintain contact with nature and its wonders. As each year passes, new opportunities occur for the Society to realize more fully upon its chartered purposes. The tide is running strong and all the signs are favorable for the growth of our institution.

THE ZOOLOGICAL PARK

THE DIRECTOR'S REPORT

WILLIAM G. CONWAY, *Director*

THE MAJOR EVENT at the Zoological Park in 1964 was the opening of a new Aquatic Birds Exhibit on September 26. The new building is marked by an exciting variety in approach and a number of techniques new to zoos. Designed by architect Harmon Goldstone, the exhibit unfolds on an ecological theme. Special features, in addition to the basic habitat presentation, include compartmentalized public viewing, multi-level exhibits, graphic displays, barrierless enclosures, mirror walls, sound effects, recorded lectures and even a machine which makes waves in a seashore habitat. Closed-circuit television aids patrol of public spaces. A special effort has been devoted to exhibit decor. (See "A New Home for the Waterbirds of the World," *Animal Kingdom,* LXVII (5), 130-141). The effective decor of the "Sea Cliffs" and "The Jungle Stream," pioneering habitats built mostly of fiberglas, and the pleasing designs of the graphic educational displays in the building are the work of Designer Jerry Johnson's new Department of Exhibition, which has become one of the Zoo's most valuable departments. (See "A Department of Exhibition at New York Zoological Park," *International Zoo Yearbook,* V, 224-225).

A vigorous Zoo improvement program was started three years ago with Zoo construction and maintenance forces. In 1964, this program, coordinated by Charles Driscoll, focused on redevelopment and landscaping of the area surrounding the new Aquatic Birds Building. Paths were altered to change public circulation patterns, a new European waterbird exhibit was developed and the outdoor flamingo display was remodeled. The lobby of the Administration Building was modernized early in the year, the animal commissary was renovated and the construction office was altered to provide space for the Designer. Under the City's Capital Budget Program and with the help of the Department of Parks, the Fountain Circle parking area was enlarged and repaved. Five moated exhibits, which will replace the old barred exhibits on the east side of the Kangaroo House, were begun.

Plans for the World of Darkness and for new Bear Exhibits were completed during the year. Construction should begin in 1965. Countless meetings and lengthy "brain sessions" mark the continuing planning for the "World of Birds," "Africa," "South America," "Australia," the "Wildlife Survival Center," the "Bird of Prey Exhibits" and the "Pheasant Aviary." The complexity of radically new exhibits and the details involved demand frustratingly-long planning periods.

Review and planning during 1964 were not confined to the development of new exhibits. The need to expand the Zoo's educational programs was a belabored subject. The Zoo has great possibilities as a teaching facility, but we find our efforts seriously hampered by the lack of an auditorium. Daily lecture tours, combined with "activity" exhibits where animals are stimulated or trained to demonstrate their special adaptations, seem an obvious path for future exploration. A continuously-operating theatre showing short wildlife films could offer a new dimension to Zoo exhibition. The need for better dissemination of natural history information calls for more active participation in television and the further development of our visual aids program. Zoo education efforts are ripe for expansion.

Except for the acquisition of many rare and beautiful water birds, the collection remained comparatively stable during the year. It is always good when losses are few; low turn-over is one of the things for which zoos strive. While 1964's acquisitions may not make exciting reading, some very rare species were bred at the Zoological Park. They include Wisent, Père David Deer, White-tailed Gnu and Blesbok in the Mammal Department and Laysan Teal, Ringed Teal, Golden-Eye and two species of Tinamous in the Bird Collection. The Reptile Department bred its first Boa Constrictor, Blue-tongued Skinks and Neotropical Milk Snakes. During 1965, the collection will fall below the 1,000 species mark because we plan to sell and distribute many of the specimens housed in the Large Bird House. We hope that progress on plans for the World of Birds will result in construction of the new building in late 1965 or early 1966. In the meantime, we will gradually acquire specimens for the World of Darkness and revise the existing collection in order to show forms of ever-greater interest. The gradual organization of the collection into breeding herds and flocks continues.

The maintenance, exhibition and breeding of wild animals in captivity is entering a new phase. The maturation of animal care technology has given zoo men new eyes with which to view problems. Dietary techniques and a better understanding of the simple physiological needs of most animal forms have enabled zoo men to turn more attention to the complex social and psychological requirements of their charges and to less obvious physical requirements.

Animal requirements for space, for activity, for social interplay and even for cyclical change pose challenging problems to "behind-the-scenes" zoo operation. The shadows of vanishing wild animal populations are superimposed upon this picture, bringing into sharp focus the necessity for developing self-replenishing captive herds and flocks of wild creatures.

Relief from boredom—from inactivity—is an important concern in the care of many animals, especially wild primates. Providing for the great apes' need for sufficient space, healthy social contact and things to do poses the kind of technological and logistic problems for a zoo curator that a social psychologist must meet in working with the city's culturally-deprived children. During the past year, objects unfamiliar to the animals were introduced into exhibition compartments, new and more climbable trees were installed, straw bedding and sugar cane and even television were all tried in an effort to provide more of interest for our primates. This is but a primitive beginning, and much imagination will be needed to discover substitutes for the variety of natural stimulation.

The issue of finding substitutes for the selective aspects of natural environment is especially troubling in our effort to breed *wild* animals generation after generation in captivity. We are not interested in developing domestic animals in zoos even though many current zoo practices foster domestication. In particular, we breed most often from the first pair of young animals that prove compatible, making too little effort to start with large groups from the wild. The eventual result may be selection for domestic sexual precocity and reduction of genetic variability. We struggle to save the weak youngster which would have died in the wild and, having done so, we perpetuate his frailities by breeding from him. By limiting herds to one breeding male, we become over-selective in sex-linked characters of the herd's progeny and compound the problem by making inadequate provision for cyclical breeding needs and behavioral changes. The future demands a new degree of sophistication in zoo animal management.

Zoo animal management did, however, take an extra long stride forward in 1964 and we acquired a bright new feather in the Zoological Society's cap. Early in the year General Curator Emeritus Lee S. Crandall's great work *"The Management of Wild Mammals in Captivity,"* was published. Mr. Crandall's unique book is the first major effort to remove wild animal care from the field of art and inexperience and to place it upon a scientific foundation of accumulated fact. (See "A Basic Zoo Manual At Last!" *Animal Kingdom*, LXVII (4), 122-124).

Research at the Zoological Park expanded in 1964 with the construction of four temperature-controlled laboratories on the Reptile House mezzanine. A stimulating investigation into reptile physiology is being supported by the Zoological Society and the National Institutes of Health. Curator Herndon Dowling is collaborating in the project with Professor Victor Hutchison of Rhode Island University. The promise of a Department of Behavioral Sciences (see page 4 in the President's Report) will aid, we hope, to create a significant program of curatorial research at the Zoo. The development of a substantial science of exotic animal husbandry should be a primary research objective of a major zoological park.

Following lengthy negotiations, conducted mostly by Comptroller Herbert Schiemann and Personnel Manager John McKew, the Society was able to enter eligible employees in a new City-sponsored pension plan. This plan, called the Cultural Institutions Retirement System, is expected to eventually replace the Society's old plan for participating employees. In the new plan, pension costs for "City-line" personnel are paid by the City of New York.

During the year, the Society also founded an employee Scholarship Loan and Tuition Refund Program. This program, designed primarily by Mr. McKew, provides aid to Zoo employees taking courses in zoology and related subjects.

Attendance fell sharply below that of 1962 and 1963 during this World's Fair year (as it did in 1939, the first year of New York's last World's Fair). This year's attendance was, however, slightly above the ten-year average. Stringent economies instituted by Facilities Manager Edward Kearney resulted in good income for animal purchases and Zoo improvements, and the performance of the remodeled Zoobar was encouraging. The renovated installation, rechristened "Zoo Terrace Buffet," is now self-service and provides efficient service in pleasant surroundings at a minimum of expense.

As 1964 drew to a close, Mr. Herbert Knobloch was promoted to Curator of Education, and Mr. McKew's position was expanded to include the title of Assistant to the Director. Mr. Conway was elected Secretary of the American Association of Zoological Parks and Aquariums, elected a Trustee of the American Committee for International Wildlife Protection, elected President of the Wild Animal Propagation Trust and was appointed to the International Survival Service Commission and also to the Advisory Board of the International Zoo Yearbook.

ZOOLOGICAL PARK COMBINED CENSUS

December 31, 1964

	Species & Subspecies	*Specimens*
Mammals	195	666
Birds	578	1,522
Amphibians and Reptiles	246	750
Totals	1,019	2,938

SUMMARY OF ATTENDANCE

Month	*1963*	*1964*
January	29,349	46,904
February	39,175	57,957
March	181,850	133,474
April	336,625	238,329
May	344,702	329,945
June	318,188	251,316
July	354,880	317,444
August	392,849	359,885
September	222,374	208,303
October	212,976	165,453
November	105,394	173,251
December	36,496	25,851
	2,574,858	2,308,112

The total number of visitors at the Zoological Park between its opening on November 9, 1899, and December 31, 1964, was 141,725,503.

DEPARTMENT OF MAMMALS

Joseph A. Davis, Jr., *Curator*
Grace Davall, *Assistant Curator*
Joseph Ruf, *Head Keeper*
Lee S. Crandall, *General Curator Emeritus*

The Society's collection of mammals in the Zoological Park at the year's end numbered 666 specimens, representing 195 species and subspecies of 48 families and 13 orders.

In an age that has seen a steady increase in the "gestation periods" of building projects, we take some consolation in the more or less predictable gestations of our mammals. The multiplicity of projects involving the Mammal Department continued to grow, each nourishing itself on man-hours of conferences, stacks of sketch-paper, site-exploration in hot sun and cold, blustery wind, and more conferences. "Africa," "Australia" and "South America," large geographical exhibits, and the "World of Darkness," are yet to complete their total development, and one project, completed late in the year, had its birth much like a kangaroo, in embryonic form. This is "African Forest West," a moated redevelopment of the old Kangaroo House yards, which has yet to be planted out. It will be another year or two before it begins to look like a real forest.

The Collection

The slight increase in the size of the collection again reflects principally the progress of our breeding program.

The decision to euthanize an incurable animal is never an easy one to make, particularly when the animal has a personality. Few such decisions have been made more reluctantly than those involving the Bengal Tigress, Dacca, born in February, 1944, and the Black Leopard, Bagheera, born in February, 1945. The infirmities of old age had been apparent for some months, and when each gave unmistakable signs of pain, we took the only possible means of ending their suffering. Both animals had been reared by hand by Keeper Martini and his wife. Throughout his long life Bagheera had accorded the Martinis an affection and docility unusual in Black Leopards, although he behaved true to breed toward almost everyone else. Dacca, who had passed the twenty-year mark, bore 32 cubs, all sired by the same male, Rajpur. The cubs were sent to zoos throughout the world, and Dacca's thirty-first cub, Dacca II, is still in the Park.

The death of Bagheera left us without a black leopard. From the National Zoo we purchased a female cub sired by an enormous Ceylonese male, along with a male cub of the spotted form, also sired by parents of excellent conformation. The two cubs, born a day apart, have proved to be compatible and will, we hope, present us with cubs in time.

Two other pairs of large cats were acquired: a pair of Clouded Leopards, our first since 1913, and a pair of wild-caught Rocky Mountain Pumas, members of the largest race of the species. A second young male Orang-utan, one of the few to be legally exported from their own land, was purchased to "back up" our male, Ollie. The new male, Briggs, was readily accepted by the three Orangs in the Great Apes House. Other additions include a fine pair of adult Humboldt's Woolly Monkeys, a young female Siamang Gibbon and a Grevy's Zebra mare.

A mate for our male Binturong was presented to us by Ethan Emery, and Dr. Edwin Gould of Johns Hopkins University donated eight tenrecs. Messrs. Hobart M. Van Deusen of the American Museum of Natural History and Stanley Grierson, on an expedition to New Guinea, collected and sent to us a White-eared Giant Rat *(Hyomys goliath strobilurus)* but delays in transit adversely affected this handsome rodent—probably the first to reach a zoo alive—and it succumbed shortly after arrival.

An Indian Pangolin (*Manis crassicaudatus*), in the collection since April 28, 1961, died on May 1, setting one of the best longevity records for the species.

THE BREEDING PROGRAM

Young born in the collection in 1964 numbered 158, an increase of 63 over 1963, as our emphasis on self-replenishing groups continues. All of the five female Blesboks acquired in 1962 and the three female Gemsboks which arrived in late 1962 and early 1963 have calved and one Gemsbok produced her second calf before the year ended. The pair of Wisent produced their second calf, a female. Other notable births include a Père David's Deer, Impala, White-tailed Gnu and Siberian Ibex, Agile Wallabies, a Mandrill, Gelada Baboon and Silvered Leaf Monkey. The Small Malayan Chevrotains continue to be prolific and a total of six were born, bringing our herd up to eleven by the end of the year.

PHYSICAL IMPROVEMENTS

Most of 1964's improvements in our physical plant have been either comparatively minor or made in the "behind-the-scenes" areas. New skid-proof floor coverings were applied in the Antelope House in stalls most in need of repair, and the African Plains Antelope House, a non-public facility, was repaired extensively.

Far more apparent are the additions to the two leopard enclosures in the Lion House and to the Great Apes House moated enclosures. In the Lion House, massive tree limbs were installed high above the cage floors to provide the leopards with more natural and more comfortable resting places. That the animals actually prefer to doze sprawled along a limb, rather than on a broad shelf, can be seen during almost any visit to the building.

When the old and unnatural posts and platforms in the Great Apes moated yards deteriorated due to weathering and the destructive curiosity of the building's inhabitants, they were removed and replaced with cut trees, trimmed just enough for safety. The first such installation this spring in the Mountain Gorilla enclosures was so successful, in terms of appeal to both the gorillas and the public, that the two Orang yards were similarly renovated in the late autumn. Large limbs were also placed in the indoor enclosure of the young Orangs.

RESEARCH

A preliminary report of the Curator's study of Chevrotain reproduction has been published, and the final report is now in preparation. The Curator's investigation of otter behavior and taxonomy continued, with emphasis on the Spot-necked Otter (*Hydrictis maculicollis*) and the Asiatic Clawless Otter (*Aonyx cinerea*). Study of the latter species was made possible through the kindness of Ethan Emery of Cincinnati, who permitted his tame specimen to be kept in the Zoological Park for observation. In addition, a study of the estrous cycle of a Peruvian River Otter, to be concluded in the spring of 1965, has been in progress. In the fall the Curator began to supervise an undergraduate student from Manhattanville College in a two-term behavioral research project, utilizing animals in the Zoological Park. Results to date have been promising enough to suggest a future expansion of the program.

OTHER ACTIVITIES

Mr. Davis attended the annual conference of the American Association of Zoological Parks & Aquariums in Houston, subsequently visiting the zoos at Fort Worth and Dallas. He spent several days at the University of Kansas and the Chicago Natural History Museum, gathering data for his otter research.

PUBLICATIONS AND PAPERS

Although it was not technically a product of the Mammal Department, the publication that made the others listed below pale into insignificance was General Curator Emeritus Lee S. Crandall's already classic "Management of Wild Mammals in Captivity."

MR. DAVIS

"The Sea Otters of Point Lobos," Part 1. *Animal Kingdom*, Vol. 67, No. 4, 1964.

"The Sea Otters of Point Lobos," Part 2. *Animal Kingdom*, Vol. 67, No. 5, 1964.

"A Preliminary Report of the Reproductive Behaviour of the Small Malayan Chevrotain, *Tragulus javanicus*, at the New York Zoo." *International Zoo Yearbook*, Vol. V, 1964.

MISS DAVALL

"A Nyala Herd, *Tragelaphus angasi*, at New York Zoo since 1939 Without New Blood." *International Zoo Yearbook*, Vol. V, 1964.

MR. CRANDALL

"The Management of Wild Mammals in Captivity." University of Chicago Press.

"Record of African Antelopes in New York Zoo," *International Zoo Yearbook*, Vol. V, 1964.

SUMMARY

A slight increase in the collection reflects progress in the Society's breeding program. A number of new specimens were acquired through breeding, purchase and gift. Physical improvements were made principally in operational areas. A small but heartening increase in the Department's research activities has been made.

FORMS NEW TO THE COLLECTION, ACQUIRED IN 1964

Cotton Mouse—*Peromyscus gossypinus* Le Conte
Asiatic Fawn-colored Mouse—*Mus cervicolor* Hodgson
Asiatic Bush-rat—*Golunda ellioti* Gray
White-eared Giant Rat—*Hyomys goliath strobilurus* Rummler

CENSUS OF MAMMALS

December 31, 1964

Orders		*Families*	*Species & Subspecies*	*Specimens*
MARSUPIALIA	Kangaroos, Phalangers, Opossums, etc.	2	6	13
INSECTIVORA	Moles, Shrews, Hedgehogs, etc.	2	5	17
CHIROPTERA	Bats	1	1	1
PRIMATES	Apes, Monkeys, Lemurs, Marmosets, etc.	6	43	89
EDENTATA	Armadillos, Sloths, Anteaters	3	3	5
LAGOMORPHA	Rabbits, Hares	1	1	1
RODENTIA	Squirrels, Beavers, Mice, Porcupines, etc.	12	36	152
CARNIVORA	Bears, Raccoons, Cats, Dogs, Otters, etc.	7	40	87
PINNIPEDIA	Seals, Sea Lions, Walruses	2	4	8
TUBULIDENTATA	Aardvarks	1	1	1
PROBOSCIDEA	Elephants	1	2	3
PERISSODACTYLA	Horses, Tapirs, Rhinoceroses	3	6	13
ARTIODACTYLA	Cattle, Sheep, Antelopes, Camels, Giraffes, Deer Swine, Hippopotamuses	7	47	276
	TOTALS:	48	195	666

Summary: Orders, 13; Families, 48; Species & Subspecies, 195; Specimens, 666.

DEPARTMENT OF BIRDS

William G. Conway, *Curator*
Joseph Bell, *Assistant Curator*
Grace Davall, *Assistant Curator*
Andrew Winnegar, *Head Keeper*
Lee S. Crandall, *General Curator Emeritus*

The Society's bird collection numbered 1,522 specimens of 578 species and subspecies on December 31, 1964. The total number of specimens is very similar to last year's but close comparison of both inventories reveals a sharp decline in passerines, counter-balanced by an increase in aquatic species. This subtle change reflects not only the opening of the new exhibit for waterbirds but also gradual preparations for the demolition of the old Bird House and construction of the new "World of Birds."

The Collection

For several years we have been seeking rare and interesting waterbirds for the new Aquatic Birds Exhibit. By mid-summer, when the building was near completion, more than 300 specimens of cormorants, herons, storks, ibises, flamingos, rails, shorebirds and kingfishers were in the collection to choose from. After careful consideration, the new habitat scenes were filled with 200 of these birds, representing more than seventy species. Most of the surplus specimens were traded or sold to other zoos, but a few are being held in reserve to draw from as needed. Acquisitions of particular note this year were three White-naped Cranes (a pair with a fully grown youngster), and eight Lilford's Cranes. We now have 48 cranes, representing 13 forms, in the collection. A young pair of White-backed Night Herons, from Liberia, were of special note because of their strange shape and unusual color pattern. Little is known about this rare species.

An Emperor Penguin (received in 1955), a Ruanda Double-collared Sunbird (received in 1949) and an Emerald-throated Hummingbird (received in 1953) were the most notable losses. The Emerald-throated Hummingbird held the best authenticated record of hummingbird longevity in captivity.

FORMS NEW TO THE COLLECTION, ACQUIRED IN 1964

Little Egret—*Egretta garzetta garzetta* (Linnaeus)
Smaller Egret—*Egretta intermedia intermedia* (Wagler)
White-backed Night Heron—*Calherodius leuconotus* (Wagler)
Gray Heron—*Ardea cinerea rectirostris* Gould
Andean Crested Duck—*Lophonetta specularioides alticola* (Menegaux)
Giant Coot—*Fulica gigantea* Eydoux & Souleyet
Chilean Lapwing—*Belonopterus chilensis chilensis* (Molina)
Wood Sandpiper—*Tringa glareola* Linnaeus
African Gray-headed Gull—*Larus cirrocephalus poiocephalus* Swainson
Black-banded Wood Nymph—*Thalurania furcata nigrofasciata* (Gould)
Green-crowned Wood Nymph—*Thalurania furcata fannyi* (DeLattre & Bourcier)
Davison's Blue-throated Barbet—*Megalaima asiatica davisoni* Hume
Indian Blue-headed Wagtail—*Motacilla flava beema* (Sykes)

THE BREEDING PROGRAM

The opening and the final entries in the Bird Department's "Egg Log" were made on January 3 and December 28, respectively. Both notations record eggs laid by a Tataupa Tinamou. This South American species breeds well for us and the young birds are useful in exchanges with other zoos. The remaining 1,441 eggs laid during 1964 represent the breeding efforts of more than eighty species. Many fine specimens were added to the collection as a result, despite the fact that we still lack adequate bird-rearing facilities. Crested Wood Partridges, Falcated Teal, Silver Gulls, Barnacle Geese, a female Black-necked Swan and a female Ringed Teal were among the prized additions this year but two Greenland White-fronted Geese and an Inca Tern gave us a special thrill, for it was the first time either species had been hatched and reared at the Bronx Zoo. Seven Laysan Teal were reared, increasing our flock to 16 of these very rare birds.

PHYSICAL IMPROVEMENTS

The new Aquatic Birds Exhibit was opened to the public on September 26, after literally years of planning, preparation and construction. It was an immediate success and has become one of the most popular exhibits in the park. The outdoor areas adjoining the new building have been completely refurbished. On the east side, the flamingo enclosure was enlarged, refenced and bordered with an attractive evergreen hedge. On the north, a new exhibit for European waterbirds was created with a winding watercourse, several islands and attractive plantings of birch, cypress and ornamental grasses. A small island, with plantings of willow and clump grass, was added just off-shore in Cope Lake. We hope it may be a future breeding site for pelicans.

RESEARCH

Shortage of staff continues to make the initiation of significant new basic research impractical and the projects carried on under this heading have been mainly on a practical plane during 1964. Experiments with pens for rearing young birds were conducted and a workable design, adaptable for a variety of species, has been incorporated in the plans for a special brooder room in the basement of the new Aquatic Birds Exhibit during 1965. Another practical research project concerns the physical requirements for maintaining aquatic plants—water hyacinth, water canna, duckweed, etc.—in bird exhibits at the new building. Air and water pumps have been installed in several ponds to help maintain a proper balance of circulation and aeration, and progress has been encouraging. Further work on the diets of certain birds whose red or yellow plumage fades in captivity has had limited results with the addition of fresh carrot juice to their daily ration. Scarlet Ibis, Roseate Spoonbills, Golden-winged Sunbirds and Scarlet-chested Sunbirds, all have shown remarkable improvement in color. As the year drew to a close, breeding acitivity at the new Aquatic Birds Exhibit began to present exciting opportunities for observation of the strange habits of birds rarely exhibited in captivity.

PUBLICATIONS

MR. CONWAY:

"Care of James's Flamingo, *Phoenicoparrus jamesi* (Sclater) and the Andean Flamingo, *Phoenicoparrus andinus* (R. A. Phillippi) in Captivity." *International Zoo Yearbook,* Vol. V, 162-164.

"Egg Replacement by a Pair of Sarus Cranes, *Grus a. antigone* (Linnaeus), at the New York Zoological Park." *International Zoo Yearbook,* Vol. V, 129.

"A New Home for the Waterbirds of the World!" *Animal Kingdom,* Vol. LXVII (5), 130-141.

MR. BELL:

"Our Resident Red-tailed Hawk." *Animal Kingdom,* Vol. LXVII (2), 57-59.

SUMMARY

The new Aquatic Birds Exhibit opened early in the fall. The outdoor flamingo enclosure was improved and a new European waterbird exhibit was created just north of the new Aquatic Birds Building. The breeding program resulted in the rearing of several species bred in the park for the first time. Research was limited but practical and expedient.

CENSUS OF BIRDS

December 31, 1964

Orders		*Families*	*Species & Subspecies*	*Specimens*
SPHENISCIFORMES	Penguins	1	6	20
CASUARIIFORMES	Cassowaries and Emus	2	3	5
TINAMIFORMES	Tinamous	1	4	13
PELECANIFORMES	Pelicans, Cormorants, etc.	3	9	24
CICONIIFORMES	Herons, Ibises, Storks, etc.	5	30	95
PHOENICOPTERIFORMES	Flamingos	1	6	45
ANSERIFORMES	Swans, Ducks, Geese and Screamers	2	104	479
FALCONIFORMES	Vultures, Hawks and Eagles	4	30	40
GALLIFORMES	Quail, Pheasants, etc.	5	33	89
GRUIFORMES	Hemipodes, Cranes, Trumpeters, etc.	6	29	83
CHARADRIIFORMES	Plovers, Sandpipers, Gulls, etc.	8	46	151
COLUMBIFORMES	Pigeons, Doves and Sandgrouse	2	21	49
PSITTACIFORMES	Parrots, etc.	1	13	18
CUCULIFORMES	Touracos and Cuckoos	2	5	5
STRIGIFORMES	Owls	1	13	21
CAPRIMULGIFORMES	Frogmouths, Nighthawks, etc.	2	2	2
APODIFORMES	Hummingbirds	1	5	8
TROGONIFORMES	Trogons and Quetzals	1	1	1
CORACIIFORMES	Kingfishers, Hornbills, etc.	4	18	27
PICIFORMES	Barbets, Toucans and Woodpeckers	3	16	23
PASSERIFORMES	Perching Birds	30	184	324
	TOTALS	85	578	1,522

Summary: Orders 21; Families, 85; Species & Subspecies, 578; Specimens, 1,522.

DEPARTMENT OF REPTILES

HERNDON G. DOWLING, *Curator*

STEPHEN SPENCOOK, *Head Keeper*

THE COLLECTION numbered 750 specimens of 246 species and subspecies of amphibians and reptiles at the end of 1964. This is four fewer kinds than were on the 1963 census and is very nearly the maximum number that may be housed in the 107 exhibition areas of the Reptile House. By remaining essentially static in exhibition space, we have dropped behind the rapidly expanding reptile exhibitions in at least two western zoos, one of which has a "Herpetarium" of almost double the floor area of ours; it contains 250 exhibition enclosures.

THE COLLECTION

Of the 796 reptiles and amphibians acquired this year, 575 were gifts, 93 were born or hatched here, 83 were purchased and 45 were received on exchange.

Among the more significant gifts and exchanges were a Reticulated Python from Mr. Alex Findlay of Weston, Ontario, a group of East African reptiles from Captain Beugt Floren of Sweden, an Isabela Giant Tortoise and some Asiatic snakes from the National Zoo, a Banded Rock Rattlesnake from the Staten Island Zoo, two Green Pythons from the Detroit Zoo, twelve island pitvipers collected by the Curator, and a number of interesting lizards and snakes from the American Museum of Natural History.

Several pythons were purchased, thereby adding to our already outstanding collection of these animals as well as aiding in our research studies on reptile metabolism. These included five Reticulated Pythons, among them three young-of-the-year, two adult Blood Pythons and three "light-phase" Indian Rock Pythons. Other purchases of interest were a baby Black Caiman and a Spitting Cobra from southwestern Africa.

For the first time in five years no Asiatic Cobras were hatched this year. This was not due to a slowdown in their breeding activity but because the clutch of fertile eggs was given to an investigator for embryological studies.

Again we had to dispose of surplus crocodilians because of inadequate space. Thirty-three animals, mainly Spectacled Caimans and American Alligators, were donated to other institutions or disposed of in other ways. Regretfully, we disposed of our adult male Morelet's Crocodile by donation to the National Zoo.

Another major loss was that of a female Duncan Island Saddleback Tortoise, collected by the Curator in 1962. It had a head injury that apparently was inflicted by a visitor. Autopsy showed it to contain more than 40 eggs that were approaching maturity. In November the adult male Albemarle Giant Tortoise was active in mating attempts with the two females of this race. On November 9, it was holding its head at an unusual angle and dragging one of its hind legs. It was found dead on November 12. Autopsy revealed a massive cerebral hemorrhage. The same cause of death was found in another adult male in 1944 (see *Annual Report* for 1944, p. 13).

REPTILES HATCHED OR BORN IN 1964

Species	*Date*	*Number*	*Bred Here*
Reeves's Turtle, *Chinemys reevesi*	Feb. 12	2	Yes
Blue-tongued Skink, *Tiliqua scincoides*	July 23	1	Yes(?)
Boa Constrictor, *Boa constrictor*	April 28	48	Yes
Neotropical Milksnake, *Lampropeltis doliata nelsoni*	Aug. 1-3	8	Yes
St. Lucia Serpent, *Bothrops caribbaeus*	Oct. 5-6	34	No
	TOTAL:	93	

In February and March a sudden infection of a highly lethal gram-negative micro-organism, *Aereobacter bacillus,* wiped out our fine exhibit of anacondas. These consisted of a female Common Anaconda *(Eunectes murinus)*, collected on Trinidad in 1956 by former Curator James A. Oliver; a Yellow Anaconda *(Eunectes notaeus)*, collected in Paraguay in 1958 by Eric Phillips; and three hybrid young that had been born in 1962. Fortunately, the adjacent enclosures were not affected.

RESEARCH AND COOPERATIVE ACTIVITIES

Much of the work of the Department during 1964 was done in conjunction with other societies and institutions. It is expected that this kind of activity will increase in the future.

In January, Curator Dowling represented the Society at the formal opening of the Charles Darwin Research Station in the Galapagos Islands of Ecuador. His report on the status of the unique fauna of the islands and the activities of the Station were instrumental in the decision of the Society to support a Conservation Officer in the Galapagos Islands for an initial three-year period.

The New York Herpetological Society, made up of non-professional herpetologists, snake-keepers and other reptile enthusiasts, has met at the Zoological Park for several years. It has always had difficulty in administering its diverse membership, however, and this led to a decline in interest and membership. Curator Dowling met with the officers and board members several times during the summer to help reorganize the group, and it is a pleasure to report that, with a new constitution and a new slate of officers, the New York Herpetological Society has now become a progressive organization of more than 300 members. It promises to become a valuable asset to the area, with its emphasis on education and conservation. Much of the new spirit is due to its president, Mr. Alfred Loeffler.

Curator Dowling was chairman of the Antivenin Survey Committee of the American Association of Zoological Parks and Aquariums this year. Reports on stocks of antivenins and on snakebites and snakebite emergency procedures were gathered from more than sixty institutions and summarized for distribution to AAZPA members and other interested parties. At the same time, the emergency procedures at the Reptile House were brought up to date and improved through the installation of an emergency warning system.

Construction by the Society of four air-conditioned and light-controlled laboratories on the mezzanine of the Reptile House enabled us to begin research on reptile metabolism. The three-year project is supported by the National Institutes of Health, with Curator Dowling and Dr. Victor Hutchison of the University of Rhode Island as co-investigators. A graduate student, Mr. Allen Vinegar, M.S., is assisting in the research and working toward his doctorate degree. In view of the close association of the two institutions in this area of mutual interest, Dr. Hutchison was made a Research Associate in Herpetology at the Zoological Park and Dr. Dowling was made Adjunct Professor of Zoology at the University of Rhode Island.

Curator Dowling continued his researches on the taxonomy of snakes and associated problems. He studied the temperature behavior of Marine Iguanas in the Galapagos Islands and the ecology of pit-vipers in the West Indies. He contributed to a "Combined Clinic" on snakebite and related problems at the Columbia University Medical School, discussed research problems in the Galapagos before the Society of Biology and Medicine of Brooklyn College and lectured on pythons to the New York Herpetological Society. He continued to serve on three committees and the Board of Governors of the American Society of Ichthyologists and Herpetologists and on the Executive Council of the Herpetologists League.

Cooperative research studies have been initiated with Dr. Edward Tauber, of New York; Dr. Aaron Copley, New York Medical School; and Dr. Ralph T. Hinegardner, Columbia University.

PUBLICATIONS (DR. DOWLING)

The Case of the Vanishing Iguanas. *Nature and Science*, Vol. 2, No. 1, pp. 3-5.

Our First Calabar Python. *Animal Kingdom,* Vol. 67, No. 1, pp. 14-15.

Goats and Hawks—a New Theory of Predation on the Land Iguana. *Animal Kingdom,* Vol. 67, No. 2, pp. 51-56.

An Exercise in Zoogeography. *Animal Kingdom,* Vol. 67, No. 3, pp. 88-91.

What is a Skink? A Cosmopolitan Reptile. *Animal Kingdom,* Vol. 67, No. 5, pp. 142-143.

Zoologist's Tour of Martinique. *Animal Kingdom,* Vol. 67, No. 6, pp. 182-185.

CURRENT LONGEVITY RECORDS—1964

Species	*Arrived in Park*
Albemarle Giant Tortoise, *Geochelone e. elephantopus* (Harlan) (At Crandon Park, 1957-62)	1928
Duncan Saddleback Tortoise, *Geochelone elephantopus ephippium* (Guenther)	1928
Indian Gavial, *Gavialis gangeticus* (Gmelin)	1946
American Alligator, *Alligator mississipiensis* (Daudin)	1950
South American Mud Turtle, *Kinosternon scorpioides* (Linnaeus)	1950
Indian Rock Python, *Python molurus* (Linnaeus)	1951
King Cobra, *Ophiophagus hannah* (Cantor)	1953
Indian Rock Python, *Python molurus* (Linnaeus)	1954
Flathead Sideneck, *Platemys platycephala* (Schneider)	1955
Asiatic Cobra, *Naja naja* (Linnaeus)	1955
Brown Sand Boa, *Eryx johnii* (Russell)	1955

CENSUS OF AMPHIBIANS AND REPTILES

December 31, 1964

Orders	AMPHIBIA	*Species & Subspecies*	*Specimens*
CAUDATA	Salamanders	13	31
SALIENTIA	Frogs and Toads	18	39
	REPTILIA		
TESTUDINES	Turtles	78	324
CROCODYLIA	Alligators and Crocodiles	13	44
SQUAMATA			
SAURIA	Lizards	25	62
SERPENTES	Snakes	99	250
	TOTALS:	246	750

Summary: Orders 5; Species, 246; Specimens, 750.

ANIMAL HOSPITAL

CHARLES P. GANDAL, *Veterinarian*

THE VETERINARIAN'S PRIMARY FUNCTION is to keep the animal collection in good health—a function with many facets, of course, some specific and immediate, some general and long-term. A good example of the latter is nutrition.

Mineral imbalances in otherwise acceptable food are apt to result in bone and joint deformities. In the past emphasis has always been placed on adequate supplementation of certain foods with calcium, phosphorus and Vitamin D, but it is evident that the ratio of calcium to phosphorus is of prime importance.

Many of our diets are now known to have an excess of phosphorus over calcium, which causes the calcium to become unavailable nutritionally, with subsequent symptoms of bone disease that are sometimes mistaken for primary dietary deficiences. This condition is frequently seen in primates in the form of simian disease or osteodystrophy fibrosa. We believe that we also saw the effects of this disease in our unsuccessful attempts to hand-rear two Wattled Crane chicks.

In the control of white muscle disease in our Nyala herd, we feel that injections of Vitamin E and selenium within the first week after birth are mandatory if we are to rear the young. Despite dietary adjustments and supplementation we did not seem to have supplied enough selenium or eliminated enough of the selenium-deficient items from the diet to enable the animals to grow normally without the injections. We now routinely inject all Nyala born in the collection and although it is too early for statistical conclusions, we are satisfied as to the importance of these preventive measures.

On a trial basis we have been using limited amounts of mow-dried clover hay, which may be incorporated in the feeding of our herbivores.

CASES OF ESPECIAL INTEREST

Obstetrical problems are not common in Zoological Park work, but the year offered two cases of dystocia due to a malpresentation of the fetus, one in a Red Deer and the other in a Grant Zebra. In both, the injection gun was used for initial immobilization of the patient, followed by anesthesia, manipulation and removal of the fetus. A case report was published on the use of this technique in the zebra.

Equally uncommon in Zoo animals is retained placenta, which occurred with two Gemsbok. Hormones and antibiotics alleviated the condition and prevented after-effects.

Treatment of certain animals is enormously facilitated by the use of the injection gun; we had recourse to it in treating an aged male Okapi, in the collection since the spring of 1949, which suffered two severe attacks of colic. They were relieved after a few days' treatment.

Surgical cases on mammals included urethrotomy in a male Markhor, removal of a fibroma from the foot of a male Reindeer, followed by several months of intensive care, and extensive suturing of a female Gelada Baboon which had been lacerated by a cagemate.

The Asiatic Elephant "Dolly" developed a severe acute arthritis in the left carpus but recovered after treatment with injectable and oral dexamethasone.

At the request of the Central Park Menagerie and in cooperation with Dr. Theodore Kazimiroff, our dental consultant, a fractured canine was removed from a tiger. The animal is now back on exhibition in the Menagerie.

Metatarsal fractures in a Sarus Crane, Demoiselle Crane and Lilford Crane were treated. Coaptation splintage is usually adequate, but intramedullary pinning is employed if indicated.

An enlarging bumblefoot lesion was surgically removed from an Emperor Penguin with excellent results. Photographic slides of the procedures were made, for possible value to other veterinarians, since there has been some reluctance to resort to surgery in such cases.

Since parasites can never be entirely eliminated in a large and constantly changing collection of wild animals, control to prevent a dangerous build-up is the best that can be hoped for. To this end, 99 mammalian, 33 avian and 48 reptilian worm treatments were given, using 16 vermifuge products. Our Lowland Gorilla "Oka" and three baby Orang-utans as well as a newly-acquired adolescent male Orang were treated for balantidia infections, using a combination of oxytetracycline and carbarsone. The entire Zebra herd was successfully wormed with either phenothiazine, thiabendazole or Dyrex mixed with the feed. Intensive therapy with phenothiazine had to be given the two White Rhinoceroses when a rapid rise in parasites was noted after we created a mud wallow for the animals.

Avian parasites were controlled quite well by treatment based on early recognition and periodic stool sampling. There was one especially interesting case; a heavy infestation of esophageal flukes was found in two Saddle-billed Storks. The parasites were identified by Dr.

Horace W. Stunkard of the American Museum of Natural History as a new species of *Cathaemasia.*

Parasites of reptiles are always perplexing, largely because identification of parasite ova is difficult and, in fact, often questionable. Now that a systematic program of parasitological studies has begun at the Reptile House, we expect an improvement in control.

On balance, the general control of parasites throughout the collection was good, but there were important failures. Despite continued treatment with a variety of vermifuges supposedly effective against trichuris, we were unable to control a massive whipworm infection in two Masai Giraffes and both were lost. The immediate cause of death was frothy bloat, which we feel was secondary to the whipworm infestation.

At the age of 19 years and 16 days, our Black Leopard "Bagheera" was euthanized because of advancing senility. Another loss in the Lion House was that of a female Snow Leopard which died of a disease that grossly resembled "idiopathic hepatitis," which we had seen in several Cheetahs and another Snow Leopard. Study of frozen material with virus isolations and animal innoculations revealed an agent seemingly quite similar to the feline panleukopenia virus. It is difficult to say they were identical, but all signs point to the animal having died from feline panleukopenia despite the fact that this cat, like all others, had been routinely innoculated against the disease on arrival.

Extensive atherosclerotic lesions of a type frequently found in human beings were revealed by the autopsy of a Common Caracara which had been in the collection since 1928.

The Disease Hazard

The possibility of disease being transmitted from animal to man is, of course, always present in the minds of the Veterinarian and his associates. Despite this awareness and the taking of all possible precautions, the Veterinarian contracted virus hepatitis in April following autopsy of a Chimpanzee that had died from the disease. It was the third time in ten years that a member of the Hospital staff had contracted hepatitis after association with affected anthropoids. During the 12 weeks of the Veterinarian's absence, veterinary work in the Zoological Park was done by Drs. Fletcher and Winokur, ably assisted by Nurse Martine and Hospital Keeper Waltz.

Cooperative Research

One hundred and sixty specimens were sent to 16 investigators and 20 specimens were supplied to students working on science projects. One of the latter took first place in the New York City Catholic High School Science Fair with her project, "Chromatography of Serum Amino Acids in Different Species' Phylogenetic Relationships."

An important connection made during the year was that with the Animal Medical Center in New York City, with which we have initiated cooperative cardiovascular and comparative pathology studies.

OTHER ACTIVITIES

The Veterinarian was appointed consultant in Zoo Animal Medicine to the Animal Medical Center. He gave a tour of the Animal Hospital and the Zoological Park to the Animal Care Panel during its meeting in New York in September. He gave talks on the Zoological Park and its veterinary service to the Putman County Kennel Club, the Pleasantville Women's Club and a Pleasantville Lutheran Church organization.

His work was featured in a guidance book, "What Does a Veterinarian Do?"

PAPERS AND PUBLICATIONS

Papers presented were:

"Pet Primates, Their Care and Treatment." Metropolitan New Jersey Veterinary Association Meeting.

"The Care and Treatment of Pet Primates." Weekly seminar, Animal Medical Center.

Publications were:

"Neoplasia in Parakeets." Current Veterinary Therapy 1964-65.
"Eggbound Birds." Current Veterinary Therapy 1964-65.

FIRST AID AND LABORATORY STATISTICS

Vencenza Martine, R.N., treated 903 first aid cases, of which 443 involved our own employees. Thirty-three members of the blood bank donated blood and 25 pints were given to seven recipients.

A mobile x-ray unit took chest x-rays of 130 employees.

The Hospital Laboratory recorded 467 specimens, including routine bacterial cultures, sensitivity tests, blood and urine tests and stool examinations. Of these, 326 involved mammals, 81 birds and 60 reptiles.

COOKROOM IMPROVEMENTS

William Colloton retired from his job in the Animal Food Commissary after 40 years as a Zoological Park employee and was succeeded by Richard Ryan. Many labor- and time-saving procedures have been initiated by Mr. Ryan. The entire commissary was renovated and a deep freeze unit with a capacity of 7½ tons was installed, so that we now use frozen horsemeat instead of the fresh supplies formerly received weekly.

* * *

In the Mortality Tables which follow, "Total in Collection" is arrived at by adding to the census at the beginning of the year all animals acquired by purchase, exchange, gift or born alive. Animals disposed of alive by sale or exchange during the year are not deducted. No acclimatization period following birth or arrival is allowed.

MORTALITY TABLE

MAMMALS

Year	*Total in Collection Throughout the Year*	*Died*	*Mortality Percentage*
1964	857	134	15.63
1963	839	136	16.20
1962	808	202	25.00
1961	724	128	17.68
1960	737	122	16.55
Totals	3,965	722	

Average mortality for past 5 years 18.20
Average mortality for past 20 years 17.24

BIRDS

Year	*Total in Collection Throughout the Year*	*Died*	*Mortality Percentage*
1964	1866	331	17.59
1963	2012	334	16.60
1962	1890	385	20.36
1961	2339	437	18.68
1960	2119	273	12.88
Totals	10,226	1,760	

Average mortality for past 5 years 16.23
Average mortality for past 20 years 16.86

DEPARTMENT OF EDUCATION

Herbert J. Knobloch, *Curator*

Michele A. Perrault, *Zoology Instructor*

Inger B. Bradbury, *Assistant Zoology Instructor*

For the first time in many years the Education Department cannot report a new record for attendance at the Zoological Park by visiting school classes and other organized educational groups. The lower attendance in 1964 was undoubtedly due, in part, to the opening of the World's Fair and closing of the Farm-in-the-Zoo. The totals for the year, as compared with 1963, are:

	1963	*1964*
Schools, Organizations and Institutions	5,238	4,166
Classes and Organized Groups	10,319	6,418
Total Class/Group Attendance	272,723	224,065

May was still the best month of the year for attendance by school classes and educational groups, though not record breaking. June was next.

	May	*June*
Schools, Organizations and Institutions	1,298	817
Classes and Organized Groups	2,154	1,548
Total Class/Group Attendance	66,549	43,617

The figures for visits by Church and Play Schools and Day Camps, during the summer, are fairly good.

	July	*August*
Schools, Organizations and Institutions	643	402
Classes and Organized Groups	643	402
Total Class/Group Attendance	41,176	26,189

Visual Aids

The department assisted in the production of four motion picture films. These were: "Always Something New at the Bronx Zoo;" "Harvest From The Sea;" "The Society Afield;" and "Above and Below the Sea Ice of Antarctica."

A new film, "Mr. Moto Takes a Walk," featuring Michele Perrault and "Mr. Moto," the young male Japanese Macaque used in the services to schools, was produced by an associate producer, William Claiborne, Inc. Miss Perrault appears in the film and also narrates it.

Pre-print materials of five films—"Introducing the Reptiles," "The Locomotion of Snakes," "Adelie Penguins of the Antarctic," "Hippo!" and "Mr. Moto Takes a Walk"—were turned over to our new distributor, Sterling Educational Films, Inc. The Adelie Penguin picture was slightly revised with a new narration before release.

Several more of our films were shown at the Trans-Lux Theatre at 49th Street and Broadway throughout the year.

Our films were shipped out on 60 rental orders at which time they were shown 213 times and seen by 20,030 people. Staff officers used 102 films to illustrate their lectures on 64 occasions. They spoke to audiences totaling 5,582 persons. Fifty-three films were shown to 5,114 persons during 57 special showings outside of the Zoological Park. Twenty-one films were previewed and excerpts from 11 were used on television.

GUIDED TOURS

The Department conducted 110 guided tours for 3,600 students at all levels of education.

SCHOOL LECTURE SERVICE

Zoology instructors in the Department gave 223 talks illustrated with live animals to a total of 56,087 students while visiting 119 schools, organizations and institutions, throughout the year. Program requests at the end of the year were enough to keep the lecturers busy until 1968.

QUESTION HOUSE

The Question House opened officially for the season at the end of April and closed at the end of October. As for some years past, it was only staffed part time because of the pressure of other educational services and activities. During the time it was staffed, about 5,000 questions were asked.

ANIMAL NURSERY

The Animal Nursery opened for the season on Saturday, March 28, and closed on Sunday, November 1. It was staffed by Mrs. Inger Bradbury and Miss Grace Donaldson.

PERSONNEL

Miss Phyllis Linnemann resigned on October 9. Mrs. Inger Bradbury joined the department as an Assistant Zoology Instructor on November 10.

LECTURES

Twenty-two lectures were given for 884 persons. Department members also participated in 13 television shows, each of which was aired three times.

During the spring 20 fifteen-minute closed circuit color television shows were produced and taped at the RCA Color Central (RCA Pavilion) at the World's Fair. Two shows were taped every Monday and then televised several times a day for the entire week. "The Bronx Zoo Show," as it was called, was seen on 300 closed circuit color television installations at the Fair.

MISCELLANEOUS

For the eighth year in a row, four special New Haven Railroad "Zoo Trains" brought 4,430 visitors to the Zoological Park from New England on spring Saturdays.

The 29th and 30th In-Service Courses for elementary, junior and senior high school teachers, "Utilization of the Bronx Zoo in the Science Program of Elementary and Secondary Schools," under the direction of the Department, were given. Forty-one teachers during the spring term and forty-six in the fall term satisfactorily passed the courses.

Our 13th 15-weeks Natural History Training Course for Girl Scout Leaders began on February 5 and ended on June 3.

Three new animal information sheets were written: "Snakes as Pets," "Guinea Pig" and "Domestic Rabbit."

Mr. Knobloch assisted with the planning and installation of the sound system at the new Aquatic Birds Building.

An 8-weeks course in natural history was given for junior high school students on Saturday mornings.

Two special programs on Zoo operations were given during August for Members' children.

DEPARTMENT OF EXHIBITS

JERRY M. JOHNSON, *Designer*

THE NEW Department of Exhibition has now had a full year in which to prove itself and its techniques, and its dozen or so tangible accomplishments have opened up endless opportunities to create new types of exhibits, eye-catching informational panels, models and signs.

The "show pieces" of the Department are the Jungle Stream and Sea Cliff exhibits in the Aquatic Birds Building, in which the massive and realistic rocks are all man-made. New materials such as polyester resins, fiberglas, epoxys and urethane foam hold possibilities undreamed of a few years ago; they can revolutionize the conventional exhibition background for many kinds of animals. Much of the Department's time was spent in working with these materials, adapting them and searching for their limitations.

In the creation of informational panels, the silk screen process permits application of complicated designs to virtually any surface. Early in the year a silk screen laboratory was set up in the Commissary building, adjacent to the Print Shop with which it must work closely. Seven elaborate panels were turned out for the Aquatic Birds Building, as well as graphic panels at the Wisent Range and the Wildfowl Pond, "New Ideas" signs for the Eagle Aviaries and the Australian exhibit area, a special sign for the Llanos Exhibit, restaurant menu boards and a few lesser panels or signs in which a sense of good design had not always been apparent before.

Mr. Johnson was consulted on color schemes for various buildings and signs, and participated in the planning of the forthcoming World of Darkness and World of Birds buildings.

Offices for the new Department were created on the second floor of the Service Building alongside the two signpainters who, with the Park's animal artist, are under Mr. Johnson's supervision.

Mr. Johnson attended the Cincinnati and Houston meetings of the American Association of Zoological Parks and Aquariums and visited the Tucson Sonora Desert Museum to observe its work with fiberglas exhibits.

CONSTRUCTION AND MAINTENANCE

Charles B. Driscoll, *Superintendent of Operations*

George Russell, *Assistant Superintendent of Construction*

Louis Sanders, *Assistant Superintendent of Maintenance*

Many of the most important projects completed by the Park forces in 1964 were for the benefit of the Bird Department. From beginning to end of the year, a great deal of effort went into readying new bird displays and renovating others.

The forces performed countless tasks in getting the new Aquatic Birds Building into shape for its occupants and for the public. The jobs ranged from installing giant cypress logs for the swamp exhibit to putting up small labels throughout the building, from erecting fiberglas rocks to putting in varieties of live plantings. Much of the area surrounding the building also was rehabilitated.

The Flamingo Pond, for example was enlarged by removing a path at the south end of the Flying Cage; then the Pond was dressed up with a new fence and landscaping. Southwest of the new building, the old Owl Cage was demolished and the adjoining bank was landscaped with evergreens. To the north, the setting for a new European Bird Exhibit was prepared by changing the course of and widening a stream running through the area, regrading and landscaping the land and repaving the paths.

The Aquatic Birds Building was one of two Capital Budget projects under the Department of Parks that was completed in 1964. The other was a rehabilitation and paving job at Rainey Gate-Fountain Circle Area. The construction included new curbing, new drains and new red-brick sidewalks.

Outside contract provided a face-lifting for the Administration Building lobby. It now has a modernized reception room with vinyl-marble flooring, a new ceiling, recessed lights, new furniture and a Macassar ebony wall panel, in which the Society's seal was set.

Other major indoor renovation in the Park included: modernization of the animal cookroom, alteration of the Construction office to make room for Department of Exhibits facilities, and construction of four new laboratory research rooms in the Reptile House mezzanine.

Space permits mention of only a few other miscellaneous jobs. Painting of course, was widespread. New water and drainage lines were put in the Yak Corrals and north corrals of the Riding Barn. Ornamental terra cotta balusters were replaced at Baird Court. Panels were made for the Society's exhibit in the City building at the World's Fair, and elaborate exhibits were put together for the 1965 Annual Meeting at the New York Hilton.

The Park's growing fleet of heavy-duty equipment handled such tasks as demolition of the Platypusary, removal of the upper Mountain Sheep walk and creation of a new island in Cope Lake. The fleet was strengthened by the addition of three new van-panel trucks and a half-ton truck. Mr. James W. Carter donated a Farmall tractor, a sod seeder, a steam cleaner, a magnetic sweeper and a power jack.

The Park forces gave nature a ground level assist by heavy mulching of the rhododendrons and other broadleafed evergreens, removing 260 dead trees, and planting a total of 987 trees, shrubs and vines.

FACILITIES DEPARTMENT

EDWARD KEARNEY, *Manager*

EDWARD QUINN, *Assistant Manager*

IF THE KEEPING of animals in a zoological park is an art and a science it can be said with equal positiveness that the revenue-producing Facilities Department of a zoo is a *business*. Its importance in our operation is that Facilities revenue from restaurants, animal rides, souvenirs and the like produce the money to buy animals and improve the Zoo.

It is a matter of some pride to the Facilities Department that both gross and net revenues held up reasonably well last year despite a decline in attendance of a quarter of a million visitors—a decline that we (like several other of the City's cultural institutions) can only associate with the first year of the World's Fair. Gross revenues continued to stand well above the million-dollar mark, but it is that last quarter-of-a-million in attendance that makes all the difference between excellent revenues and good revenues.

Indeed, considering the steady rise in the cost of manpower and supplies, we feel that we did remarkably well in 1964 to produce a net profit of $166,000. Costs, somehow, were held to the 1963 level, but only by the strictest economy and close management.

The wisdom of changing the style of operation at the old ZooBar Restaurant, by making it completely buffet service, was apparent very early in the season and became more manifest with every passing week. In 1963 it showed a loss of nearly $2,000; at the end of 1964 the modern Zoo Terrace Buffet showed a *profit* of more than $37,000. And, gratifyingly, this was accomplished with increased service to the public. More than 150,000 persons got quick service and carried their meals to the redwood picnic tables under the plane trees, where 700 persons can be accommodated at a sitting.

The new operation was so successful that we are planning a somewhat similar modernization of the Flamingo Terrace Restaurant, where operational losses have been heavy. It should be ready for operation in the spring of 1965.

MISCELLANEOUS OPERATIONS AND SERVICES

Children's Zoo. At the close of its 24th year of operation, the Children's Zoo had been host to a total of more than seven million visitors. Many of the "temporary" structures in use since the opening in 1941 are now in need of replacement and plans for a completely new Children's Zoo are being considered.

Riding Track. Under the direction of Ponymaster Frank Beehn, the Riding Track gave 293,355 rides last year. It was the first year under operation by the Facilities Department.

Tiger Trains. Reflecting the decline in general attendance, the Tiger Trains gave approximately 32,000 rides during the spring, summer and early fall.

THE AQUARIUM

REPORT OF THE DIRECTOR

Paul L. Montreuil

The past year held an ample share of both good and bad moments of decisive significance to the future of the Aquarium. A major event was the retirement of Christopher W. Coates after a sudden illness at summer's end, which forced him to slow down his pace. The Aquarium owes its very existence to Mr. Coates, its Director since 1956 when construction started at Coney Island, and its Curator and Aquarist through the heroic days in the Lion House at the Zoological Park and at the Battery before that. Through the years Mr. Coates has come to be recognized as the dean of American aquarists, and we sincerely hope we will be able to continue calling on his wisdom, knowledge and experience as our Director Emeritus and Consultant for a long time to come.

Coney Island was severely affected by the tensions of the summer of 1964, with results which spelled financial disaster for several of the local business establishments and entertainments. Although the Aquarium also felt the reduction in numbers of the usual beach and fun-seeking crowds, the decrease in our attendance was so much slighter than that which prevailed for the area in general, that it did in fact provide convincing proof of the continuing popularity of our establishment.

It is a curious fact that many New Yorkers seem unaware of the Aquarium's existence in Coney Island. Almost daily we encounter people who nostalgically recall the old New York Aquarium at the Battery and were regular visitors there, but have only recently heard of the Coney Island Aquarium. We now have three main objectives, each essential for the eventual attainment of our goal of having the best aquarium, with an attendance in proportion to the population of New York City. These are: to increase public awareness of the Aquarium as a pleasant and instructive place of recreation for the whole family; to improve our exhibits, grounds and facilities so as to attract a clientele which will want to return with family and friends; finally, to increase in size, number and variety of exhibits to proportions which will enable us to present a broad and well-integrated picture of life in the water which covers so much of our planet.

Approval of the preliminary plans for our proposed expansion, by the City Planning Commission and the Zoological Society's Board of Trustees, puts us well on our way. Barring unforeseen delays, it is hoped that the final plans of the new Hall, with its living reef and ecological displays, the Topical Exhibits Hall and the spectacular Shark Drome, will be completed by the end of the coming year.

Corrosion and structural damage made it necessary to overhaul our principal exhibit, the Oceanic Tank. This formidable task was undertaken with some trepidation, as it was difficult to estimate beforehand the full extent of what would be involved, both in repairs and in effect on the animals. The job was begun in early winter and will not be limited to simple reconditioning, but will include modification for better exhibition of the animals it is to hold.

Display techniques have been the subject of experimentation, looking to incorporation into our proposed expansion as well as immediate use in our present exhibits. Many of our displays, originally stop-gaps, have been less than satisfactory for some time, due to age, corrosion and decay. These will be replaced with tanks which exploit more modern display and construction methods.

Disease and epidemics play such a vital role in the maintenance of aquatic community exhibits that the subject is always foremost in the minds of practicing aquarists. The New York Aquarium, in its practical operation and in the scientific studies of its staff, has long been concerned with this aspect of aquariology and has assumed a position of leadership in research on fish diseases. The addition to our staff of a veterinarian who feels challenged by the myriad unknowns of health and disease in aquatic organisms is a normal outgrowth of this orientation, although probably the first case in America of a V.M.D. holding an aquarium staff position. So many problems await solution that the difficulty lies in choosing which to attack first. Two are of prime concern to us at the moment—nutritional physiology of our marine mammals, and ravages caused among our tropical fish by a protozoan parasite which, within the last few years, has become a major pest in aquariums the world over.

The Aquarium's long-standing reputation in research is an enviable one, with many "firsts" and "onlys" in fields as varied as ethology and biochemistry, genetics and pharmacology. Construction is due to start early in the coming year of the Osborn Laboratories of Marine Sciences, which will finally provide our research staff with one of the finest research facilities anywhere. The vast horizons of aquatic biological research are being increasingly appreciated by other research institutions, and it is gratifying for us to be granted the facilities and tools to maintain our position in the forefront of this frontier of science.

The Aquarium has recently achieved some degree of fame in another area, as repository of one of the most complete collections of marine mammals. Circumstances have prevented us from holding as prominent a position as we would like in the exhibition of fishes and in the significance and coherence of our displays in general, although some have been consistently spectacular. Growth continues apace in the areas in which we already excel. Lest the tail wag the guppy, however, it is imperative that we re-establish a better balance, and this will result from the consolidation of our present facilities, and from our proposed expansion.

AQUARIUM OPERATIONS

Carleton Ray, *Curator*

Joseph R. Geraci, *Associate Curator*

Aage Olsen, *Superintendent*

Jewell Bungay, *Business Manager*

In preparation for the planned expansion of the Aquarium, we have attempted to stabilize the present collection and to place increased emphasis on the extremely troublesome problems of nutrition and pathology in marine species. The addition to the staff of an Associate Curator, a veterinarian formerly of our Laboratory staff, reflects this emphasis. Collection of animals continues to offer no problem to us, our main concern being the lack of space in which to hold, treat and condition the species we wish to exhibit for long periods of time. It is a fact that few species of marine fishes, for instance, breed in captivity and many do not eat or grow properly. We wish, in the future, to show fishes and other aquatic forms in as natural condition as possible and handling and exhibition techniques must be improved now for the proposed expansion.

Fishes and Invertebrates

From time to time species come into the collection fortuitously, without our being aware of it until they are well on their way to being established in the tanks. Two years ago, probably in a shipment of fishes from Florida, the larvae of a translucent anemone[*], 2-3 inches long, came to us. Today, the species is so well-established that it has taken on the status of being practically a pest. It has grown in carpets over some of the displays and walls of warm-water tanks, and rocks covered with them are more or less constantly replaced. Several species of butterfly fishes recently introduced into these exhibits have been seen eating these prolific invertebrates and perhaps a natural balance will take place. Other accidental introductions include a large yellow-cream colored sponge, a lovely colony of fan worms, some species of encrusting sponges, and innumerable microscopics. That most of these invertebrates go more or less unnoticed by the public, except for the decoration they supply to the exhibit, is a challenge to the aquarist. The problem of effectively drawing attention to small or sessile animals, even microscopic ones, it still with us. They can be extremely important biologically, because of the essential role some play in the "balance" of the aquarium or in the food-chain. In other instances these cultures, when sustained, can yield valuable materials for the experimentalist in our own laboratories or in others. And, unfortunately, they can be a source of disease.

Collections of fishes and invertebrates by Aquarium staff were not many this year, since longevity, especially in the larger individuals, continues good. Dr. Ray collected several species of tide pool animals in March from the Bahamas, using a drugging technique at low tide. Many fishes, normally reef inhabitants as adults, occur in tide pools when very young and many of these are spectacularly colored, not resembling the adults at this time. Further, beautiful sea urchins and the gobies which live among their spines are best collected in such localities. Also sent from the Bahamas by Dr. Ray were three deep-water fairy basslets, *Gramma melacara,* a species only found at depths exceeding 80-100 feet in the Bahamas and possibly the Caribbean as well.

Our annual major collection of large and small reef species came to us again from Bermuda. They were collected through the offices and energies of Trustee and Mrs. H. Clay Frick, using their motor-sailor and well boat, "Rockfish." Twenty-three species, numbering 101 individuals, arrived on July 17. Among the many spectacular specimens were: bonefish, an excellent collection of butterfly fish, the usual fine group of brilliantly-colored parrotfishes, two huge hogfishes and some large Spanish hogfishes.

The Sunrise Fish Company at Islip, Long Island, continues to be our main source of larger local fishes. A number of porgies, puffers, sea basses, flounders, dogfish sharks, skates, a guitar fish, hake, menhaden, sea robins, and a sand tiger shark were collected with them this year. Two spearfish remora, which usually live on marlin or in their gill cavities, were collected off Montauk but failed to survive away from their "normal" host. The giant spearfishes have not been kept in captivity anywhere, to our knowledge.

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[*] Recently identified as *Aiptasia carnea.*

We received a number of shipments from the tropical waters of the world and are now receiving many fishes directly from collectors in the Indo-Pacific and Atlantic tropics, rather than from local dealers. A quarantine procedure has been instituted as routine, to isolate and, if necessary, treat new arrivals until they are given a clean bill of health. It is planned to remodel and rearrange the tankroom, to increase our holding and isolation facilities. This will alleviate the serious problems resulting from the introduction of pathogens on incoming fish or in their water, which often multiplied to epidemic proportions.

From the west coast, largely from the Steinhart Aquarium in San Francisco and the Vancouver Public Aquarium in British Columbia, as well as the Seattle Aquarium, we received large Pacific invertebrates, mostly sea cucumbers, starfish and Giant Pacific Octopus. We can usually count on having one of the latter in the collection in spite of their delicacy in captivity. Worthy of mention also is the longevity we have been able to attain with the giant Alaska King Crab. At year's end, two had survived eight months.

In mid-August, a new 20,000 gallon outside tank for pelagic schooling fishes and sharks was opened and fishes placed in it. This exhibit, which employs the principal of biological filtration with air lift pumping and reduced reservoir gallonage, was designed by Thomas Riddick and Associates who also worked out our very successful Oceanic Tank filter. After several months' experimentation with this technique, which is essentially new in applications of this size, the tank was supporting a magnificent school of Atlantic mackerel, among the most difficult marine species to maintain in captivity. Moreover, the mackerel were growing. This exhibit is an integral part of the new hall of fishes which is planned in the next few years, and besides the proof it provides of the efficiency of this method of operation, it yields data of vital importance in the design of our proposed large new tanks and their filtration and circulation systems.

MARINE MAMMALS

The necessity of emptying the Oceanic Tank of water and transferring its two Belugas, or white whales, still the only ones successfully maintained over a long period, brought many changes to our collection and several dangers inherent in such action. Such intelligent and delicate creatures do not usually take kindly to changes of environment, but Alex and Blanchon ate very shortly after being placed in their new home in Tripool Number Three. However, crowding of seals inevitably resulted, and some species went off feed. Without holding facilities off public view, we experienced some critical times and some losses, none of which might be physically attributable to the moves themselves, but probably to the stress involved. So little is known of marine mammals—about as much as about gorillas fifty years ago—that stress of various sorts could be playing a part, as well as the unknowns of nutrition and disease.

A mate for our male Belugas has long been high on our list of desiderata. In April, the Quebec Aquarium organized a collecting trip to Rimouski, following reports that Belugas ventured into a harbor which could be closed off with a net. On their invitation, Director Montreuil joined the venture, the success of which would depend on Belugas chasing inshore-spawning schools of herring. Unfortunately, a change in weather and sharp drop in temperature put off the spawning run beyond the time available to the collecting party, and we were obliged to abandon our efforts. The area is a promising one, however, and virtually certain of yielding at least a few prime animals, with a minimum of stress and with a high probability of a pregnant female.

In May, the Beluga weir at Ile aux Coudres in the St. Lawrence River yielded two females, a young calf and a sub-adult. These were acquired, transported by truck and immediately placed on exhibit.

As has been the case with so many of the animals we have acquired from local collectors, inevitably subjected to the unrelenting succession of stress involved in capture, handling, transportation, handling again and introduction into the noisy, unnatural conditions of exhibition with strange and dominant animals, these two did not survive. The immediate causes of death were a generalized *Staphylococcus* lung infection for the large female sub-adult and infestation by lungworms possibly resulting in interstitial pneumonia for the calf. Lungworms are a common occurrence in nature and usually result in death only under conditions of stress. This experience reinforces our need for isolation facilities.

We are now more firmly convinced than ever of the importance of interspersing periods of restful acclimation between the capture and transportation phases before placing these animals on exhibit. Acclimation, isolation and quarantine are essential in handling all newly arrived marine mammals, and especially the Cetacea. We do not propose further attempts at acquiring Belugas until these are available.

The Aquarium has handled more species and more numbers of polar and sub-polar mammals, pinnipeds and cetaceans, than any other institution. We still maintain the largest collection extant of these creatures, and the rarest, but we must expect difficulties with success.

We are immeasurably aided in the acquisition and holding of marine mammals by research under grants such as that from the National Science Foundation. This allows us to bring rare animals such as Weddell Seals from Antarctica and to study them at the Aquarium as well as in the field. It also obliges us to provide study facilities in conjunction with exhibition areas and we are planning special tanks, partly financed through grants. Here new arrivals will be medically cleared before being placed on exhibition, something not possible heretofore.

In January, our two female Gray Seals produced pups, a male and a female. In less than three weeks the 30-pound pups were weaned at 110 and 120 pounds respectively. They molted and began feeding and were shipped in the late winter to the San Diego Zoo. Very few species of seals have been born in captivity, the Harbor Seal being by far the commonest. Even the Gray Seal, relatively rare in nature but fairly common in captivity since its range is near centers of population, has produced pups only a few times in captivity, and then by females already pregnant when captured. Our Gray Seal parents came to the Aquarium from Canada through the offices of Director Montreuil, then Director of the Quebec Aquarium. Two females arrived in 1958 and a male in 1961 as pups and a one-year-old respectively. Pups were born when the females were six and four years old and to our knowledge they were the first seals of this species bred and born in captivity. Mating occurred after the pups were weaned and pups are expected in 1965. This trio forms an extremely interesting exhibit —as "natural" a one as is likely to be seen of pinnipeds in captivity.

The Fur Seal, *Callorhinus ursinus*, is a very different species which is North Pacific in distribution, breeding on the Pribilof Islands. In 1962 we received our first, a female, and this year received three more: a male in February and a male and female in September. These are extremely active animals and are peculiar in that they are without blubber, but depend on a thick, unwettable fur to keep them insulated from sub-arctic water. They came to us through the courtesy of the United States Fish and Wildlife Service, Bureau of Commercial Fisheries. We are studying various aspects of their biology. Historically, this has been a difficult species to maintain in captivity.

Olaf the Atlantic Walrus, the first mammal to come to the Aquarium, in 1956, continues on his ponderous way. His weight is estimated at almost 3,000 pounds and he has recently developed the heavy neck and dominant behavior of a mature animal. He is a "show" by himself and is symbolic of the uniqueness and excellence which the New York Aquarium wishes to evidence in the future.

Attendance and Facilities

Monthly attendance at the New York Aquarium for 1964 was as follows:

January	11,841	July	42,557
February	17,042	August	49,261
March	22,599	September	20,745
April	27,489	October	14,753
May	29,578	November	19,129
June	32,548	December	9,136

Total: 296,678

Admissions revenue was $194,758, a substantial decrease as compared with last year's $212,287. Nevertheless, Facilities operations netted a profit of $62,066, an increase of $5,532 over last year despite an attendance drop of 44,659. The Parking Lot was the chief revenue-producing facility, with a profit of $45,031. A cinder-top Parking Lot was completed at the east end of the Aquarium property and opened for the July 4 weekend. The capacity is about 115 cars and although this was only operated on weekends, the gross income was $2,819.

Souvenir gross sales were $29,767 and the profit was $10,445, a slight decrease.

In January the Aquarium entered into a rental contract for a number of Acoustiguide units with a recorded 45-minute message describing the exhibits. By means of an earphone each machine could be used by either one or two people. Despite its merit as an educational feature, the Acoustiguide was not self-supporting and the contract was not renewed for 1965. It may be considered again when the new exhibit hall is completed.

Publications

Mr. Montreuil

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Mr. Coates

Safe Hiding Places Moved While You Wait. *Animal Kingdom,* 67 (3): 77-79.
The Pettable Catfish. *Animal Kingdom,* 67 (4): 110-111.

Dr. Ray

Studying the Weddell Seal in Antarctica. *Animal Kingdom,* 67 (2): 34-43.
The Blackcap Basslet. *Animal Kingdom,* 67 (5): 152-156.

Physiological Ecology of Antarctic Seals of the Tribe Lobodontini. *Bull. U. S. Antarctic Projects Officer,* U. S. Navy, 5 (10): 62-63.

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DR. BASLOW

Neurosine, a New Oligopeptide Isolated from the Brain of Fish and Other Cold-blooded Vertebrates. I. Identification and Partial Characterization. *J. Fish. Res. Bd. Canada,* 21 (1): 107-113.

The Effect of Thermal Acclimation on Brain Cholinesterase Activity of the Killifish, *Fundulus heteroclitus. Zoologica,* 49 (1): 41-51. With R. F. Nigrelli.

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Electrosine, a New Ninhydrin Negative Imidazole Compound Isolated from Electric Tissue of the Electric Eel, *Electrophorus electricus. American Zoologist,* 4 (3): 332. With R. F. Nigrelli & M. F. Stempien, Jr.

DR. RUGGIERI

Effects of Extracts of the Red Web Starfish, *Patiria miniata,* on Sea Urchin Eggs. *American Zoologist,* 4 (4): 431. With R. F. Nigrelli.

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DR. GOREAU

Mass Expulsion of Zooxanthellae from Jamaican Reef Communities after Hurricane Flora. *Science,* vol. 145: 383-386.

DR. KALLMAN

Genetics of Tissue Transplantation in Isolated Platyfish Populations. *Copeia,* No. 3, 1964: 513-522.

An Estimate of the Number of Histocompatibility Loci in the Teleost *Xiphophorus maculatus. Genetics,* 50 (4): 583-595.

Homozygosity in a Gynogenetic fish. Genetics, 50 (2): 260-261. Abstract.

Evidence for the Existence of Homozygous Clones in the Self-fertilizing Hermaphroditic Teleost *Rivulus marmoratus* (Poey). *Biological Bulletin,* 126 (1): 101-114. With R. W. Harrington, Jr.

DR. SCHREIBMAN

Functional Pituitary Grafts in Fresh Water Teleosts. *American Zoologist,* 4 (4): 176. With K. D. Kallman.

Hormonal Control of Fresh Water Tolerance in Hypophysectomized Teleosts. *American Zoologist,* 4 (4): 177. With K. D. Kallman.

DR. GERACI

Hematology of the Bottlenose Dolphin *Tursiops truncatus*. *American Journal of Physiology*, 207 (6): 1367-1370. With William Medway.

PERSONNEL

Mr. Coates, now Director Emeritus, invited representatives of American and foreign aquariums to attend a Public Aquarists' Meeting at the New York Aquarium in August. The meeting was organized with the aid of Mr. Lee Finneran of the New England Aquarium and was held just prior to the annual meetings of the American Society of Ichthylogists and Herpetologists.

Curator Montreuil was appointed Acting Director in October.

Dr. Ray ended his duties as Secretary of the Bahamas National Trust in March, was appointed Society Council Member and was elected to the Executive Committee of the Trust. He continued on the Marine Mammals Committee of the American Society of Mammalogists. He lectured on Antarctic mammals to Millbrook School, the Biology Club of Adelphi University, a seminar at Woods Hole Oceanographic Laboratory, a seminar at Beth Israel Hospital, Kane Lodge of the Free and Accepted Masons, The Explorer's Club, the United States Antarctic Research Program's Orientation Program at Shenandoah National Park, and the Bio-Med Society of Brooklyn College.

Dr. Nigrelli gave the following lectures: "Metabolites of the Sea," to the Physiological Chemistry Seminar, Mt. Sinai Hospital, New York City; "Fish Diseases and Comparative Pathology," Animal Medical Center Seminar, New York City; "Metabolites of the Sea and Their Evolutionary Significance," Mendel Lecture for 1964, St. Peter's College, Jersey City.

Meetings attended by Dr. Nigrelli in 1964 were: International Society of Toxicology and Federation Societies of Experimental Biology, Chicago; American Society of Microbiology, Washington, where he was chairman of the scientific session on "Pollution of Marine Waters" and where he attended the *ad hoc* committee meeting on Aquatic Microbiology. He also attended meetings on "Comparative Pathobiology" at Aspen, Colorado, the University of Colorado, sponsored by the Committee on Pathology, National Research Council, and the Pathology Training Committee, National Institutes of Health. He lectured on "Comparative Pathobiology of Poikilothermic Animals, Especially Fishes."

Dr. Nigrelli was elected a member of the International Academy of Pathology and Honorary Member of the Mendel Society, St. Peter's College, Jersey City. He was awarded the 1964 Mendel Lecturer

Plaque and Key of the Society. He was appointed to the Panel of Experts of the FAO by B. R. Sen, Director-General.

Drs. Stempien and Baslow attended the 6th International Congress of Biochemistry held in August in New York City.

Dr. Baslow was invited to present a paper on "Pharmacologically Active Materials from the Sea" at meetings of the Canadian Federation of Biologists in Halifax in June.

Dr. Goreau attended the Third Caribbean Geological Conference held at the University of Miami, where he presented a paper in collaboration with V. A. Zan on "The Geomorphology of the Coral Reefs on the North Coast of Jamaica."

Expeditions to collect deep sea sponges were made by Drs. Nigrelli, Stempien, Pulitzer and Lee, to Bimini, Bahamas; by Drs. Pulitzer and Nigrelli to Jamaica and Santo Domingo; by Dr. Pulitzer to Puerto Rico. More than 200 species of sponges were collected for biochemical analyses. This collection was made possible by the assistance of Dr. Thomas Goreau and his staff at the University of West Indies, by Miss Idelisa Bonnelly de Calventi, Director of the Institute of Marine Biology in Santo Domingo, and by Dr. J. Randall, Director of the Institute of Marine Biology, University of Puerto Rico at Mayaguez.

While in the Dominican Republic, Drs. Nigrelli and Pulitzer were guests of the Universidada Autotoma de Santo Domingo, and were assisted in the diving operations by frogmen of the Dominican Navy.

Dr. Kallman gave papers at meeting of the Genetics Society of Amercia and the American Society of Ichthyologists and Herpetologists.

Dr. Schreibman attend the 4th International Symposium of Comparative Endocrinology.

COLLABORATORS AND THE NATURE OF THEIR COLLABORATIONS WITH THE NEW YORK AQUARIUM

DR. PETER ABRAMOFF, Marquette University, Milwaukee, Wisconsin. Gynogenesis in *Poecilia formosa*.

DR. EUGENE AGALIDES, General Dynamics/Electronics, Rochester, N. Y. Effects of drugs on electric fishes with relation to temperature adaptation.

DR. WILLIAM ANTOPOL, Director, Pathology Department, Beth Israel Hospital, New York. Diseases and pathology of cetaceans and other marine mammals.

DR. JAMES W. ATZ, American Museum of Natural History, New York. Genetics of *Xiphophorus*.

DR. JOHN N. BALL, University of Liverpool, England. Pituitary of poeciliids.

IDELISA BONNELLY DE CALVENTI, M.S., Director, Marine Biological Institute of the Dominican Republic, Santo Domingo. Collection of sponges and other invertebrates for biochemical studies.

DR. ION O. COCIOBA, Beth Israel Hospital. Microbiology of pinnipeds.

DR. REZNEAT DARNELL, Marquette University, Milwaukee, Wisconsin. Gynogenesis in *Poecilia formosa*.

ERWIN ERNST, M.S., Chairman, Department of Biology, Setauket High School, Long Island. Sub-aqua expert. Starfish distribution and ecology.

DR. FRANCIS H. FAY, Arctic Health Research Center, Anchorage, Alaska. Temperature regulation, nutrition and growth of walruses.

ELMER T. FELTZ, Arctic Health Research Center. Microbiology and virology of pinnipeds.

DR. HAROLD FINK, Director of Laboratories, Coney Island Hospital. Pathology of marine animals.

DR. GEORGE H. FRIED, Beth Israel Hospital. Enzymology of pinnipeds.

DR. KURT GERSTMANN, Staff Pathologist, Coney Island Hospital. Pathology of marine animals.

PETER R. GIMBEL, New York. Diving-photography in Antarctica.

DR. KENNETH GOLD. Laboratory of Marine Biology, Lamont Geological Laboratory, Palisades, New York. Imidazole compounds in fish brains and in phytoflagellates.

DR. ELI GOLDSMITH, New York University Dental College. Effects of holothurin on various biological systems.

DR. THOMAS GOREAU, Department of Physiology, University College of the West Indies. Collection of sponges and other biological material.

DR. ROBERT W. HARRINGTON, JR., Entomological Research Center, Vero Beach, Florida. Hermaphroditic *Rivulus*.

DR. W. D. HARTMAN, Peabody Museum, Yale University. Taxonomy of sponges.

DR. JOHN KILBY, University of Florida. Parthenogenesis in fishes.

DR. MILAN J. KOPAC, Professor of Biology, New York University. Biophysics and biochemistry of pigment formation in health and neoplastic diseases of fishes.

LT. DAVID O. LAVALLEE, USN. Underwater technology and sound production of pinnipeds.

DR. L. EDGAR LEE, Department of Pathology, Yale University. Pathogenesis of fish tumors; comparative pathology.

DR. JOHN J. A. MCLAUGHLIN, Haskins Laboratories, New York. Analysis of "red-tide"-producing toxic dinoflagellates.

DR. ROBERT R. MILLER and R. JACK SCHULTZ, Museum of Zoology, University of Michigan. Gynogenesis in fishes.

DR. ERWIN H. MOSBACH, Public Health Research Institute of the City of New York. Biosynthesis of sterols in sponges.

DR. DAVID NACHMANSOHN AND ASSOCIATES, Department of Biochemistry and Neurology, College of Physicians and Surgeons, Columbia University. Electrophysiology of Electric Eel and other fishes.

DR. NEZIHE OZTAN, University of Istanbul. Cytology of pituitary and thyroid tumors in fishes.

DR. GUSTAVO PULITZER, Portofino, Italy. Collection and identification of sponges.

Dr. Donn E. Rosen, American Museum of Natural History, New York. Genetics and evolution of *Xiphophorus*.

Professor Michele Sara, Director of the Institute of Comparative Zoology, University of Bari, Italy. Collection, identification and biochemistry of sponges.

William E. Schevill, Woods Hole Oceanographic Institution. Bioacoustics of marine mammals.

Dr. Anna M. Slicher, Bingham Oceanographic Laboratory, Yale University. Pituitary gland of fishes.

Miss Edna Stein, Senior Bacteriologist, Coney Island Hospital. Microbiology of marine animals.

Dr. Harry Sobotka and Associates, Department of Chemistry, Mount Sinai Hospital, New York. Chemical characterization of holothurin.

Dr. Horace Stunkard, American Museum of Natural History, New York. Parasitic worms in fishes and other aquatic animals.

Dr. Pierre Tardent, University of Zurich. Embryological effects of Bonellin.

Dr. Henry Vogel, Bureau of Laboratories, Department of Health, New York. Tuberculosis in fishes and other cold-blooded animals.

William A. Watkins, Woods Hole Oceanographic Institution. Bioacoustics of marine mammals.

Dr. John W. Wells, Department of Geology, Cornell University. Ecology of coral on deep fore-reef slope of Jamaica, W.I.

RESEARCH AND REPORT OF THE LABORATORIES

Aquarium Laboratory and Staff Research. Paul L. Montreuil, *Director of the Aquarium;* Ross F. Nigrelli, *Pathologist and Director of Research;* Carleton Ray, *Curator;* Joseph R. Geraci, *Associate Curator;* Johanna van de Kerkoff, *Technician.*

1. *Pathological Studies of Fishes.* In the years when the Aquarium was at the Battery, a troublesome cause of disease and death of fishes was a monogenetic trematode or fluke known at the time as *Epibdella.* Although this species, now known as *Benedenia,* is still a threat to our collection, it seldom results in an enzootic. Problems have not all been solved, however, for early in our present operation marine fishes were found to be highly susceptible to an algal-like protozoan called *Oodinium,* a species that appeared only occasionally at the Battery. Fortunately, this parasite is easily controlled by the addition of small quantities of copper ions, added to the circulating system in the form of copper acetate in less than one part per million. About three years ago, a mild enzootic was noted that eventually became severe in 1964.

The organism responsible for this new outbreak was identified as *Cryptokaryon irritans,* a histophagous ciliate that causes considerable erosion of the gills, skin, fins and eyes. It looks and behaves like *Ichthyophthirius,* the well-known "Ich" of freshwater fishes. The parasite was first described from marine fishes in Shanghai in 1938 and later showed up in aquaria in Europe and England. The species was identified by Dr. Eleanor Brown, Chelsea College of Science and Technology, from specimens obtained in marine fishes in the London Aquarium in 1950 and again in 1961. Its spread as an aquarium pest throughout the world may be related to the increase in importation of susceptible marine fishes from the Indo-Pacific. The predisposing factors in our Aquarium have not yet been determined but the first outbreak caused by this parasite, which is often complicated by invasion by several species of ciliated epibionts, coincided with the use of salt water delivered from deep wells low in pH and oxygen, factors that are easily adjusted to "normality" by vigorous aeration. It may well be that an imbalance of the alkaline reserves may be contributory. These factors are being investigated.

Studies concerning degenerative changes in liver, spleen, heart, blood vessels and other organ systems associated with conditions inherent in captivity have been continued. The presence of massive iron-positive accumulations in cell clusters in the kidney and liver of several species of marine fishes may represent a unique method of iron storage. Haemosiderosis and haematochromatosis, accumulations of iron pigments in man and other mammals, are pathological lesions due to abnormal iron metabolism. It is assumed that fish may have an efficient mechanism for the storage of high concentrations of iron but with no pathological results. The exact nature of the cells involved in iron storage in fish is now being studied in collaboration with pathologists at the Coney Island Hospital.

2. *Pathological Studies on Marine Mammals.* The year was highlighted by the successful anaesthesia and dental surgery performed on our two-year-old female walrus, Sapiunuk. All conservative efforts failed to curb her tusk grinding on the abrasive surfaces of the pool. She had developed a gingivitis and periostitis, a potential source of the sinusitis which was responsible for the deaths of two other walruses, Ookie and Tipuk. Through the combined efforts of Drs. Theodore Kazimiroff of New York University and a Fellow of the Society; Robert Nuttall, Director of Professional Services of Ayerst Laboratories in New York City; and Joseph R. Geraci, she was gently anaesthetized by the careful, controlled administration of *Fluothane* supplied by the generosity of Ayerst Laboratories. While under anaesthesia her tusks were fitted with vitallium caps, made gratuitously by

Eric Bausch, C.D.T., of the Austenal Company, New York, from impressions made earlier by Dr. Kazimiroff.

Sapiunuk is the first walrus to undergo successfully anaesthesia and surgery of this type, and valuable experience was acquired despite the fact that because of insufficient adhesive surface, the caps dropped off soon after she resumed her tusk-grinding behavior.

It is only within the past decade that we have been able to dispel some of the mysteries regarding the maintenance of marine mammals in captivity. The need for greater knowledge of nutritional requirements and disease processes is now generally recognized and is being investigated. In the past, many of our losses were caused by ingestion of foreign bodies, such as coins, metal scraps, and the like, with resulting gastritis, ulcers or intoxication. We are pleased to report that no such losses were incurred by our mammals, although a service post-mortem on one bottle-nosed dolphin from an exhibition group at the World's Fair disclosed rubber balls and a wide assortment of hardware in the stomach. Another dolphin from this group died of peptic ulcers. In collaboration with Dr. Kurt E. Gerstmann, Staff Pathologist at Coney Island Hospital, studies of the exact nature of the peptic ulcers is being made and the results will soon be published. In addition, the possible role of histamines, a breakdown product of fish used as food for these animals, is under investigation as a contributory factor.

Post-mortem findings on two Weddell and one Ringed Seal showed the presence of uric acid kidney stones. The predisposing factor is believed to be a metabolic defect due to a nutritional imbalance. Studies are currently in progress to determine the relationship of diet to the formation of renal calculi in these species.

Our young male walrus, Mayuk, succumbed to an overwhelming bacterial infection, originating from an abscess which could not be controlled by medication or surgery.

We are grateful to Drs. Harold Fink, Director of Laboratories, Kurt E. Gerstmann, Staff Pathologist, and Miss Edna Stein, Senior Bacteriologist, all from Coney Island Hospital, for their generous assistance in our disease problems in marine mammals.

3. *Biology of Antarctic Seals.* Under a grant from the National Science Foundation to the New York Zoological Society, Principal Investigators Montreuil and Ray entered the second year of work on the least known of all pinnipeds, the Antarctic lobodontine seals.

Our knowledge of the ecology, behavior and migrations of marine mammals is sketchy at best, because of the limited contact it is possible to have with them. In the case of Antarctic seals, it is even more meager because of their more complete isolation from man's predations. Study of the parasites of seals of the Northern Hemisphere was found by Montreuil to provide valuable information relating to the biology of the hosts, shedding light on previously unanswered questions of routes of migration, nature of food, segregation of populations, etc. On the assumption that similar studies on Antarctic seals could yield comparable results, preliminary sampling of Weddell Seals was made in the Antarctic spring and fall of this year, and of the Crabeater Seal in the fall. All animals were collected in the vicinity of McMurdo Sound, in the Ross Sea, the early ones by Dr. Ray and Mr. Jacob Hiller, and the later sampling by Director Montreuil, during an animal collecting trip.

The parasitic helminths found in seals examined in the field laboratory at McMurdo leave no doubt that continued parasitological investigation is bound to yield valuable insight into the biology of these fascinating animals.

The Weddell Seal is also an ideal animal for the study of bioacoustics. It is an animal typical of shore ice of the Southern Continent and is restricted to tidal cracks and holes for access between air and water. This year, Dr. Ray, with Lt. David O. Lavallee, U.S.N., and Mr. Peter R. Gimbel, in cooperation with Messrs. William E. Schevill and William A. Watkins of Woods Hole Oceanographic Institution, collaborated in the first prolonged simultaneous sight observations and electronic recordings of any marine mammal in nature. At a location three miles northeast of McMurdo Base, the techniques of SCUBA diving and underwater observation chamber were combined with electronics in order to better understand the sonic behavior in orientation and food-finding and in general underwater behavior of the Weddell Seal. A film was produced, giving preliminary results of our experiments.

In addition, Dr. Ray in collaboration with Dr. William Antopol, Dr. George Fried and Mr. Jacob Hiller, investigated the enzymology and microbiology of Antarctic pinnipeds. Finally Dr. Ray in collaboration with Mr. Murray Smith of Canterbury University, New Zealand, completed research on the thermoregulation of the Weddell Seal.

4. *General Marine Mammal Biology.* Director Montreuil continued investigations on the acanthocephalan parasites of Arctic seals. Dr. Ray completed work on the thermoregulation of the walrus.

Laboratory of Marine Biochemistry and Ecology. Ross F. Nigrelli, *Director of Research;* Martin F. Stempien, Jr., *Senior Investigator and Research Associate;* Morris H. Baslow, *Research As-*

sociate; VINCENT LIGOURI, *Research Assistant;* GUIDO J. RIO, *Research Associate;* WELLS P. OWEN, *Technical Assistant;* GEORGE D. RUGGIERI, *Visiting Research Associate.*

Studies on biologically active substances extracted from marine organisms have been continued with the financial support of the John A. Hartford Foundation.

Early in 1964 an extensive collection of sponges was made in Bimini, Jamaica, Santo Domingo and Puerto Rico. During July, August and September, aqueous and methanolic extracts were made of the dried specimens, many of which were found to be highly active when tested for both toxic and antibiotic effects. While some initial work on the biochemical nature of these substances is still in progress, more extensive study depends on identification of the species involved, as a number of specimens have been shown to be examples of the same sponge from different localities. This fact is in itself important, as it supports the assumption that the biologically active substances present in these specimens are actual metabolites of the sponges and not materials concentrated from the environment of the animal. Some 40 species of an initial 200 have been identified thus far. These identifications are being made by Dr. Gustavo Pulitzer of Portofino, Italy, in collaboration with Professor Michele Sará of the University of Bari, Italy.

Studies on the tetraglycosides of the Holothuroidea led us to examine other orders of the Phylum Echinodermata for the presence of similar compounds. We were able to demonstrate the presence of saponin-like toxins in a number of the Asteroidea: *Pycnopodia helianthoides* (sunburst starfish) *Patiria miniata* (red-web starfish) and *Asterias forbesi,* our local species of starfish. It is proposed to call this class of toxins *asteroidins,* as the *holothurins* have become known as toxins of the Holothuroidea. In 1964 we extended these investigations and found similar substances in *Pisaster ochraceus* (the purple starfish) and *P. brevispinus* (the short-spined starfish). With the exception of *Asterias forbesi,* all the starfishes used in these studies came from the north Pacific. Preliminary biochemical studies have shown that the sugar moieties, at least, are different in the *asteroidins* from those found in *holothurin A,* one of the glycosides from the Bahamian sea cucumber *Actinopyga agassizi.* Further, initial experiments with *Arbacia punctulata,* a species of Echinoidea, an order comprising the sea urchins, showed the presence of saponin-like chemicals but to a lesser degree and virtually non-toxic to fishes. All of the extracts showed varying degrees of toxicity when tested on developing sea-urchin eggs and on fish.

The imidazole compounds found in the brain and other tissues of fishes were investigated further by Dr. Baslow. A number of experiments were performed using brain homogenates on the degradation of *N-acetylhistidine,* one of the imidazoles so far identified. Using C^{14}-histidine and acetyl-coenzyme-A, it was shown that these substances are needed in the synthesis of *N-acetylhistidine* and that it can be degraded to histidine. It is suggested that N-acetylhistidine in the brain of fishes is involved in one of the more primitive membrane permeability phenomena elicited by acetycholine. Experiments are also in progress to isolate large amounts of *electrosine,* another new imidazole compound from the electric tissue of the electric eel, in an attempt to chemically characterize the substance.

Laboratory of Fish Genetics. KLAUS D. KALLMAN, *Principal Investigator;* JUDITH FROMOWITZ KALLMAN, *Laboratory Manager;* MARTIN P. SCHREIBMAN, *Visiting Research Associate;* HAROLD WURF, *Technician.*

Fifteen genetically defined stocks of platyfish, *Xiphophorus maculatus,* are maintained in the Laboratory, eight of them rigidly inbred strains that have been maintained for up to 41 generations by brother-sister matings. Three strains can be traced back to fish collected in 1939 by Dr. M. Gordon in the Río Jamapa, Veracruz. They are the most inbred strains of fish in existence and become increasingly important for biological research.

In addition, 8 strains of *X. hellerii,* 4 strains of *X. couchianus,* 2 strains of *X. milleri,* 2 strains of *X. variatus* and one of *X. montezumae* are maintained. Other stocks kept are *Poecilia formosa* (4), *P. vittata* (2), *Priapella intermedia* (1) and *Phallichthys fairwetheri* (1).

The Monterrey platyfish, *Xiphophorus c. couchianus,* is restricted to the Huasteca Canyon in Mexico, where it occurs in small numbers. Destruction of its habitat through human interference has brought this species to virtual extinction. As this report goes to press, the last population may already have been wiped out. The three strains at the Genetics Laboratory and one stock in Hamburg, Germany, are then the only survivors of the subspecies. The feasibility of reintroducing the species from laboratory stocks to a more favorable location in Mexico is now under study. We could show that *X. couchianus,* because of its small population size, is "naturally" inbred and therefore represents an important subject for the study of the genetics of tissue transplantation. This species also offers unique opportunities to study the effects of prolonged geographic isolation.

Fin (skin) transplantations were performed among several other species of platyfish and swordtails, in order to determine the genetic variability of natural populations. Transplants survive only if donor and recipient possess an identical set of genes. Since the number of genes that determine tissue compatibility is quite large, the chances that two individuals taken from a large population possess compatible genotypes are very small. Over 1,300 transplants between brothers and sisters were made, but not one graft was successful. Most disintegrated within three weeks, a demonstration that in fish, tissue specificity is as highly developed as in mammals, including man. It also suggests that in the human being, grafts between fraternal twins or between sisters do not have a better chance to survive than transplants between unrelated individuals. When transplants were made between sibs of parents collected from small populations, a high percentage of the grafts survived indefinitely.

Dr. Schreibman continued his investigations on the pituitary gland of platyfish and swordtails. He found that these fish need a pituitary hormone to survive in fresh water. When the pituitary was removed the natural ability of the fish to survive in fresh water was abolished. The hypophysectomized fish had to be maintained in one-third sea water. Several hormones were injected into operated fish in fresh water, in order to determine which one is the fresh water factor. Only prolactin kept the fish alive indefinitely.

The pituitary gland was also removed from its normal position below the brain and transplanted into the caudal musculature. Such a graft secretes the fresh water factor, but does not produce or release many of the other pituitary hormones. These experiments provide evidence that the pituitary gland in fishes is under the control of the hypothalamus.

Physiology and Ecology of Coral Reefs. Thomas Goreau, *Department of Physiology, University of the West Indies, Jamaica, Principal Investigator;* Nora I. Goreau, *Research Associate;* E. L. Boehm, *Special Research Assistant;* Ross F. Nigrelli, *Consultant.*

The central research theme of the Coral Reef Project, supported by funds from National Science Foundation grants to the New York Zoological Society, is biological calcification in relation to the formation of tropical coral reefs. Inevitably, this subject has wide ramifications ranging through biochemistry, geology and geophysics. An idea of the diversity of the research now being carried out by the Coral Reef Project may be gained by summarizing the field currently under investigation; (1) ultrastructure of reef corals and their symbiotic algae; (2) taxonomy of corals, algae and sponges living in reefs; (3) symbiosis and nutrition of reef corals and related forms; (4) mechanism of calcification in corals and coralline algae; (5) relation of environmental factors to calcification and colony form in corals and algae; (6) rate of sediment formation in reefs and the problem of diagenesis of high magnesium carbonates; (7) destruction of coral reefs and the translocation of reef sediments into deep waters; (8) form and evolution of modern coral reefs in relation to the geologic history of their antecedent platform.

The progress of future research on coral reefs in Jamaica will depend on available funds and facilities. Not only must the present *status quo* be maintained, but the rate and variety of research done in the Coral Reef Project should be increased. This cannot be achieved without additional personnel, both permanent and visiting, and improved facilities, especially on the north shore of Jamaica, preferably in the vicinity of Runaway Bay where excellent reef formations are to be found. If improved facilities are provided, more scientists and graduate students will come to work in this area on special problems related to coral reefs.

Marine Fouling Laboratory, U. S. Naval Applied Science Laboratory. ARNOLD FRIEBERGER, *Materials Engineer, Material Sciences Division,* USASL: Christopher Coleger, *Materials Engineer,* USASL; Giacomo Liberatore, New York Aquarium, *Biologist;* Ross F. Nigrelli, *Consultant.*

Four species of barnacle larvae were successfully mass-reared from embryos to cyprid stage in the Laboratory. Emphasis in the current work is being placed on the development of techniques and standards for the controlled settlement and attachment of cyprids on test surfaces.

Ultraviolet irradiation equipment for the treatment of incoming laboratory sea water has been built and will be installed.

Census of the Aquarium, December 31, 1964

		Species & Subspecies	*Specimens*
Phylum Chordata			
Class Chondrichthyes—Sharks, Rays, and Chimeras			
Orders			
Squaliformes	Sharks	2	2
Rajiformes	Rays	1	1
Class Osteichthyes—Bony Fishes			
Clupeiformes	Tarpon, Herring, etc.	2	7
Cypriniformes	Catfishes, Minnows	7	22
Anguilliformes	True Eels	4	7
Cyprinodontiformes	Killifishes	3	200
Gadiformes	Codfishes, etc.	1	2
Gasterosteiformes	Sticklebacks, Pipefishes, Seahorses, etc.	1	6
Beryciformes	Squirrelfishes, etc.	2	7
Perciformes	Perch-like Fishes	38	184
Pleuronectiformes	Flatfishes	3	8
Echeneiformes	Remoras	1	1
Tetraodontiformes	Trunkfishes, Trigger Fishes, Puffers, etc.	5	12
Class Reptilia—Reptiles			
Testudines	Turtles	2	4
Class Aves—Birds			
Sphenisciformes	Penguins	1	8
Class Mammalia—Mammals			
Pinnipedia	Seals, Sealions & Walruses	8	15
Cetacea	Whales	1	2
Phylum Porifera—Sponges		2	100
Phylum Coelenterata			
Class Anthozoa—Corals and Anemones		5	274
Phylum Annelida			
Class Polychaeta—Marine Worms		2	102
Phylum Arthropoda			
Class Crustacea—Lobsters, Shrimps, Crabs, etc.		10	84
Class Arachnida—Spiders, Horseshoe Crabs		1	6
Phylum Mollusca			
Class Gasteropoda—Snails		1	3
Class Pelecypoda—Oysters, Clams, etc.		3	208
Class Cephalopoda—Octopus, Squids		2	4
Phylum Echinodermata			
Class Asteroidea—Starfishes		8	41
Class Holothuroidea—Sea Cucumbers		1	6
Class Echinoidea—Sea Urchins		1	25
	Totals	118	1,341

Summary: Species & Subspecies, 118; Specimens 1,341.

GENERAL ACTIVITIES

DEPARTMENT OF TROPICAL RESEARCH

Jocelyn Crane, *Director*
Michael G. Emsley, *Assistant Director*

Associates:
Jane V. Z. Brower; L. P. Brower; William G. Conway; Julie C. Emsley; William K. Gregory; Donald R. Griffin; David W. Snow; John Tee-Van

For the Department of Tropical Research the past year was a time when we had to grow in a hurry to keep pace with our accomplishments. Work centered as usual in the mountain forests of Trinidad at Simla, the William Beebe Tropical Research Station. Here our basic programs all branched out like a tropical tree in the rainy season. Academic workers invited or welcomed in past years as co-investigators, independent zoologists or graduate students now returned with new grants, added associates and other students. One of the erstwhile graduates arrived last June with a student of his own, which must make Simla some kind of grandparent.

Expectably, everybody needed more room to work, eat, sleep and store burgeoning apparatus. At the summer's height we totalled sixteen persons, excluding local assistants. Although it sometimes seemed that construction could never keep ahead of plane arrivals, we did manage. More importantly, we made a great deal of progress in certain problems of biology, centered on particular birds, bats. butterflies and other selected animals.

Personnel and Research

The principal investigators, their scientific associates and their assistants, continued to build on foundations laid in previous years. In addition several programs were started in fields new to Simla, including studies of bat migration and insect bio-acoustics. The major groups of workers, their academic affiliations and their research problems at the Station, may be grouped as follows.

Dr. L. P. Brower, Amherst. Biological bases of courtship, warning color, distastefulness and mimicry in butterflies. *Associates:* Dr. J. V. Z. Brower, Amherst; Dr. Lawrence Cook, Leicester. *Student Assistants:* H. Croze, Amherst and Oxford; M. Jones, Mount Holyoke and Harvard. *Scientific Artist:* M. Cook. Dr. Brower's work was in part correlated with Miss Crane's below.

C. T. Collins, Florida. Comparative physiology and ecology of Trinidad swifts. The present year completed Mr. Collins's field work toward his doctorate. He also continued studies of other birds, begun by Dr. D. W. Snow.

J. Crane, New York Zoological Society. Comparative biology of heliconiine butterflies; systematics and biology of fiddler crabs of the world; preliminary work on bio-acoustics of Trinidad orthopterans. *Associates:* in butterfly morphology and behavior, Dr. M. G. Emsley, University of the West Indies; in sensory physiology of butterflies, Dr. S. L Swihart, Lehigh and State of New York; in acoustical physics of crabs and orthopterans, Michael Flinn, London and Harvard. *Assistants:* scientific artist and chief laboratory assistant, J. C. Emsley, New York Zoological Society; student assistant in butterfly behavior, J. R. G. Turner, Oxford; student assistant to Dr. Swihart, R. Varnum, Lehigh; laboratory assistants, K. Campbell, C. Lai-Fook and T. Lai-Fook.

Professor D. R. Griffin, Harvard. Biology of bats. Associated in the study of fish-eating bats, Dr. R. A. Suthers, Harvard, who during the year completed his doctoral thesis on the subject. *Assistants,* in various aspects of bat study, all from Harvard: technical, M. Flinn, J. Friend; student, T. Williams.

During the year arrangements were made with Dr. Emsley, an Associate of the Department since 1963, to become its Assistant Director starting January 1, 1965.

SHORT-TERM SCIENTIFIC VISITORS

Among our guests were Dr. Cliff Potter of the University of Durham, who during his geological survey of the neighborhood examined our water supply and advised us on its improvement; Dr. Michael Salmon of the University of Maryland, who made a short visit as consultant on acoustical aspects of fiddler crab work; Dr. Jerome Rozen, Chairman of the Department of Entomology of the American Museum of Natural History, and Dr. Petre Wygodzinsky, its specialist in Diptera; Professor Hans Brattstrom, the Norwegian marine biologist; Dr. David W. Snow, the Department's former Resident Naturalist, on his way back to Oxford after two years in the Galapagos; Professor A. E. Chickering of the Museum of Comparative Zoology, who was studying spiders; Dr. Coleman Goin, from the University of Florida, investigating frogs; and Professor Neal Weber of Swarthmore, the authority on leaf-cutting ants, who visited us briefly with a group of students.

VERDANT VALE ESTATE

A material highlight of the year was the purchase by the Society of a neighboring estate in Trinidad, comprising 49 acres of wooded slopes and a superb site for a new staff house. The existing bungalow, beyond repair, will be replaced during the first half of 1965. The new structure will then house Assistant Director and Mrs. Emsley, their children and, during crowded seasons, several research workers. The new property brings the Society's Trinidad holdings to more than 260 acres.

CONSTRUCTION, IMPROVEMENTS AND REPAIRS

Accommodations for living and those for research were given equal priorities, since divisions in importance between the two classes of construction were impossible. Presented in purely temporal order, therefore, the principal additions to our plant were as follows: The main house at Simla was extended to the east by a laboratory room and a double bedroom. With funds provided largely by Professor Griffin's grants and partly by the Simla Fund, the existing 48-foot bat cage had its roof raised, and, beside it, an extension was built for laboratory work. A semi-prefabricated cottage, housing four people, was erected near St. Patrick's cottage. Finally, we finished a small frog pool on the north terrace.

In addition, the usual maintenance and repair work was performed on floors, roofs, garden, driveway, citrus groves and boundaries.

TRAVEL

During the past year, birds and insects were studied, in relation to research at Simla, in Surinam, Venezuela and Panama. Dr. and Mrs. Emsley, on leave in England, finished work in the British Museum and elsewhere on a paper for publication in *Zoologica* on heliconiine butterflies. On December 1, Miss Crane left Simla for a three months' trip around the world, in connection with her work on fiddler crabs.

GRANTS AND GIFTS

Support was furnished for the various research programs at Simla by several agencies in addition to the New York Zoological Society. The principal organizations were the National Institutes of Health, the National Science Foundation, the Office of Naval Research and several English sources. In addition, several universities with staff and students summering at Simla contributed through fellowships and grants-in-aid.

A new grant from the National Science Foundation to the New York Zoological Society was received for continued support of heliconiine butterfly research during the next two years. The professional personnel consist of Miss Crane, Dr. Emsley and Dr. Swihart.

Generous gifts were received from Department friends who included, among others, Dr. and Mrs. Wilbur G. Downs, Mr. and Mrs. Warren Kinney and the Garden Club of Morristown, N.J. All of them made possible a variety of welcome activities and improvements, ranging from motion picture film for the crabbing trip to complete household furnishings for the new cottage. A favorite addition is a nine-inch waterfall for the Frog Pool, just outside the Simla diningroom. The frogs seem unimpressed, but all the human residents enjoy our pygmy cataract.

Contributions, 1964

1052. Breeding Seasons and Annual Cycles of Trinidad Land-birds. D. W. Snow & B. K. Snow. *Zoologica,* 49 (1): 1-40.
1053. In Memoriam: Charles William Beebe. Lee S. Crandall, *Auk,* 81 (1): 36-41.
1054. Mimicry: Differential Advantage of Color Patterns in the Natural Environment. L. P. Brower, J. V. Z. Brower, F. G. Stiles, H. J. Croze & A. S. Hower. *Science,* 144: 183-185.
1055. The Nature of the Electroretinogram of a Tropical Butterfly. S. L Swihart. *Jour. Insect Physiol.,* 10: 547-562.
1056. An Electrophysiological Investigation of the Visual Processes of a Neotropical Butterfly. Stewart L Swihart. Ph.D. Thesis: Lehigh University. 118 pp. University Microfilms, Ann Arbor, Mich.
1057. Birds, Butterflies and Plant Poisons: A Study in Ecological Chemistry. Lincoln Pierson Brower & Jane Van Zandt Brower. *Zoologica,* 49 (3): 137-159.
1058. Protective Display and Sound Production in Some New World Arctiid and Ctenuchid Moths. A. D. Blest. *Zoologica,* 49 (3): 161-181.
1059. The Geographical Distribution of the Color-pattern Components of *Heliconius erato* and *Heliconius melpomene* with Genetical Evidence for the Systematic Relationship between the Two Species. Michael G. Emsley. *Zoologica,* 49 (4): 245-286.
1060. Studies on the Schizopteridae (Hemiptera-Heteroptera) with Special Reference to the Taxonomy of the Trinidadian Species. Michael G. Emsley. Ph.D. Thesis: University of London. 231 pp.
1061. Acoustic Orientation by Fish-Catching Bats. Roderick Suthers. Ph.D. Thesis: Harvard University. 137 pp. University Microfilms, Ann Arbor, Mich.
1062. The Superspecies *Drosophila paulistorum.* Th. Dobzhansky, Lee Ehrman, O. Pavlovsky & B. Spassky. *Proc. Nat. Acad. Sci.,* 51 (1): 3-9.
1063. Eight Bats from Trinidad. J. D. Pye. *Animals,* 3 (7): 185.
1064. William Beebe; 1877-1962. Anonymous. *Animals,* 4 (14): 389.
1065. "Bugged" Burrow Reveals Fiddler Crab Secret. Anon. *Animal Kingdom,* 67 (6): 187.
1066. A Swimming Pool for Bats. *Trinidad Evening News.* July 22.
1067. Annual Report of the Department of Tropical Research for 1963.

PUBLICATION AND PHOTOGRAPHY

WILLIAM BRIDGES, *Curator*

DOROTHY REVILLE, *Editorial Assistant*

SAM DUNTON, *Photographer*

HENRY M. LESTER, *Photographic Consultant*

IN A DEPARTMENT such as this one, the twin functions of Publication and Photography seldom receive equal emphasis during the year. Sometimes Publications, sometimes Photography, is in the ascendancy and in 1964 it was the latter—particularly the Photographic Library. It received and is attempting to digest some 10,000 negatives made by Dr. William Beebe between 1901 and 1927.

This enormous collection was for many years housed in the laboratory of the Department of Tropical Research in the Zoological Park and no doubt Dr. Beebe could instantly lay his hands on any given negative, despite duplicate numbers that might refer to his pheasant expedition in the Himalayas *or* to his laboratory in the British Guiana jungle. We are not so omniscient and since Dr. Beebe's death and the transfer of his negatives to the Photographic Library, Mrs. Reville has been struggling valiantly to re-number the entire collection serially and in chronological order, to expand identifications, to locate missing negatives or make copy negatives from prints—in short, to assimilate and make useful a photographic record of parts of the world that have undergone vast changes in the forty to sixty years since Dr. Beebe first knew them. The end is not in sight. But progress is being made.

The Photographic Library completed 14 albums of Aquarium contact prints, whose captions of common and scientific names were checked; range information has been included in many of them. By an ingenious key system, it is now possible to find in a matter of seconds the photograph of any Aquarium animal for which we have a negative.

A breathing spell is what the photographic section wants most at the moment. It is unlikely to get one, for Mr. Dunton turned in 887 still negatives or color transparencies last year, almost double his output of the previous year. Short of taking away the Photographer's 35 mm. and 2¼ × 2¼ cameras and reverting to the 4 × 5, 5 × 7 and 8 × 10 camera days, there seems to be no way of slowing down the spate of negatives.

Mr. Dunton produced two 11-minute motion picture films, "Always

Something New at the Bronx Zoo" and "Harvest from the Sea," the latter about activities of the year at the Aquarium.

Gradually the department's motion picture equipment is being modernized. Mr. Robert G. Goelet presented an Arriflex motion picture camera with a useful zoom lens and two additional lenses—152 mm. and 300 mm.—that had been purchased for use with our Bolex. An Omega enlarger and a rotary drum print dryer were added to the darkroom.

Mrs. Reville designed, and the Construction Department fabricated, two colorful panels 7 feet high and 20 feet long for exhibition at the City Building at the World's Fair. Enlarged photographs and text related the Zoological Park and the Aquarium to the cultural life of the city.

A picture booklet, 16 pages in black-and-white plus a cover in color front and back, was published for sale in the Zoological Park. Called, simply, "Animals," it has had a fair sale both here and in other zoos which bought copies in quantity.

The publications section also edited and saw through the press a 12-page pamphlet by Victor H. Cahalane of the New York State Museum, "A Preliminary Study of Distribution and Numbers of Cougar, Grizzly and Wolf in North America." At the year's end Mr. Bridges was master of ceremonies for an animal and motion picture show for about a thousand children of subscribers to Channel 13, the Educational Broadcasting Corporation station, on three mornings between Christmas and New Year's. The programs were given in the Lion House and the Education Department and the various animal departments cooperated enthusiastically.

MEMBERSHIP

Gordon Cuyler, *Membership Chairman*

Membership continues to grow. Nearly a thousand persons—982, to be exact—joined the Zoological Society in 1964 as a result of direct appeals through Newsletters and promotional material. The increase over 1963 was 535 Members, giving a total of 5,127 at the year's end. Income from Membership dues was $96,101, an increase of about 11% over the previous year.

Special tours for Members, conducted by Curators at the Zoological

Park and the Aquarium, attracted enthusiastic groups. Six tours were given, including two "behind the scenes" for the children of Members. In the week between Christmas and New Year's, the Membership Department arranged for three special parties in the Zoo for supporters of Channel 13/WNDT, the Educational Broadcasting Corporation's station.

A folder entitled "It's Spring!" was mailed to prospective Members in the spring, and in the fall a stimulating Newsletter from Africa, by William Eddy, was widely circulated. Newsletters from our people in the field continue to be a strong means of attracting and sustaining the interest of Members.

THE CONSERVATION FOUNDATION

The 1964 Annual Report of the Conservation Foundation, the affiliate of the New York Zoological Society in conservation work, may be had upon request from the Foundation's offices at 30 East 40th Street, New York, N. Y. 10016.

JACKSON HOLE BIOLOGICAL RESEARCH STATION

L. Floyd Clarke, *Director*

The Jackson Hole Biological Research Station at Moran, Wyoming, was established by the New York Zoological Society with a series of research studies in 1946, and is now sponsored jointly by the Zoological Society and the University of Wyoming. During the past year two developments of considerable significance to the Station took place: (1), the Station was granted a new 20-year Use Permit with the National Park Service; and (2), the New York Zoological Society appropriated $10,000 to be used in connection with a similar amount made available by the University of Wyoming for the construction of three new cabins, a new library-seminar building, buck fence for enlarging the total area, and other improvements.

The following research projects were conducted at the Station during the summer of 1964.

Margaret Altmann—A comparative study of interspecies communications. Assisted by Kenneth Johnston. Supported by the National Science Foundation.

Alan A. Beetle—Trends in vegetation in Teton County, Wyoming. Assisted by David Clarke. Supported by the Wyoming Natural Resource Board, Teton National Forest Permittees Association and the Wyoming Agricultural Experiment Station.

Kenneth L. Diem and *Garth S. Kennington*—Some aspects of plant and animal distribution. Supported by the University of Wyoming.

Ralph W. Dimmick—Population study of Canada geese in Jackson Hole, Wyoming. Supported by the Wyoming Game and Fish Department.

William C. Edwards—A study of the plant ecology of the willow flats. Supported by the New York Zoological Society.

Howard E. Evans—Comparative ethology of solitary wasps. Supported by the National Science Foundation.

Douglas B. Houston—An ecological-physiological study of moose. Supported by Grand Teton National Park.

John W. Huckabee—Third Creek Waterfowl study. Supported by the New York Zoological Society.

Donald C. Lowrie—Habitats of the spiders of the genus *Pardosa* in the Jackson Hole region. Supported by the New York Zoological Society.

Glenn A. Noble—Environmental influence on parasitic infection. Assisted by Joseph Choi. Supported by the National Science Foundation.

Edward Oswald and *John H. Rumely*—Plant ecological studies in Grand Teton National Park. Supported by Grand Teton National Park.

Gerald Scherba—Social organization among colonies in ants. Assisted by John Cummings. Supported by the National Science Foundation.

William Thurmond—Melanophore-stimulating substances in Amphibia. Supported by the New York Zoological Society.

FINANCIAL STATEMENTS

Exhibit A

NEW YORK ZOOLOGICAL SOCIETY

BALANCE SHEET • December 31, 1964

Assets

Cash		$ 513,337.06
Investments (quoted market value $13,866,831.43)		10,937,273.15
Receivables:		
City of New York	$ 310,980.31	
Other	14,210.16	325,190.47
Inventories, at cost:		
Park facilities	43,675.26	
Aquarium	10,406.60	54,081.86
Facilities' assets, at cost less depreciation:		
Zoological Park (note 1):		
Improvements to land and buildings	321,214.06	
Equipment and miscellaneous items	33,381.50	
	354,595.56	
Aquarium equipment and miscellaneous items	9,549.01	364,144.57
Prepaid expenses and deferred charges		35,098.45
Deposit on contract—purchase of real estate (note 4)		54,790.00
National collection of heads and horns, art gallery, library and sundry items	at	1.00
Collection of living animals	nominal	1.00
Jackson Hole Research Station buildings	amounts	1.00
Simla Tropical Research Station		1.00
		$12,283,919.56

Liabilities and Funds

Accounts payable and accrued expenses		108,706.94
Funds:		
Endowment funds—principal nonexpendable (Exhibit C)	2,085,309.75	
Funds functioning as endowment—principal expendable (Exhibit C)	5,139,230.65	
General Funds (Exhibit D)	3,911,097.10	
Special purpose funds (Exhibit E)	1,039,575.12	
		12,175,212.62
		$12,283,919.56

See accompanying notes to financial statements.

EXHIBIT B

STATEMENT OF INCOME, EXPENDITURES AND APPROPRIATIONS

Year ended December 31, 1964

Income:	*Gross*	*Costs*	*Net*
Investments—interest and dividends	$ 436,524.30	—	436,524.30
Gain on disposal of investments, net	21,511.80	—	21,511.80
Annual dues	96,101.35	—	96,101.35
Gifts for operations	33,468.53	—	33,468.53
Portion of special purpose grants for operating costs	26,335.06	—	26,335.06
Sales of publications and photographs	9,013.36	—	9,013.36
Other	22,965.52	—	22,965.52
	645,919.92	—	645,919.92
Transfer from special purpose funds	639,932.92	—	639,932.92
Zoological Park:			
Operations and maintenance	1,198,119.30 (1)	1,401,736.92	(203,617.62)
Facilities & Admissions	1,205,992.05	982,514.39	223,477.66
New York Aquarium:			
Operations and maintenance	283,668.07 (1)	412,176.41	(128,508.34)
Facilities	146,055.34	83,989.14	62,066.20
Total	$4,119,687.60	2,880,416.86	1,239,270.74
Expenditures:			
Improvements:			
Zoological Park		$ 179,409.54	
New York Aquarium		95,171.64	
Research		258,442.77	
Purchase of living animals		35,595.36	
Conservation of natural resources and animal life		163,942.72	
Education		51,845.34	
Publications		85,415.68	
Membership		41,234.17	
Executive		53,069.90	
Employee benefits		87,671.30	
Other		49,912.37	
Total expenditures			1,101,710.79
Excess of income over expenditures			137,559.95
Appropriations to special purpose funds			223,477.66
Net change for year			(85,917.71)*
Distributed as follows:			
General working fund		(85,226.32)	
General development fund		(691.39)	
			$ (85,917.71)

*See net increase in funds on Exhibit D.

	Zoological Park	*New York Aquarium*
(1) Includes:		
Provided by City of New York	$1,198,119.30	88,909.37
Admission fees	—	194,758.70
	$1,198,119.30	283,668.07

See accompanying notes to financial statements.

Exhibit C

STATEMENT OF CHANGES IN ENDOWMENT FUNDS AND FUNDS FUNCTIONING AS ENDOWMENT

Year ended December 31, 1964

	Endowment funds	*Funds functioning as endowment*
Balance at beginning of year	$ 2,053,036.27	5,163,869.85
Add gain on disposal of investments, net	32,273.48	80,360.80
	2,085,309.75	5,244,230.65
Deduct transfer to general working fund	—	105,000.00
Balance at end of year	$ 2,085,309.75*	5,139,230.65

* Balance consisting of:

George F. Baker fund	166,232.00
Edward P. Casey fund	124,230.38
Mary Thurston Cockroft fund	58,763.78
Robert Jaffray fund	21,192.58
William Pyle Philips fund	15,629.97
Rockefeller fund	1,536,913.39
Jacob H. Schiff fund	162,347.65
	$ 2,085,309.75

See accompanying notes to financial statements.

Exhibit D

STATEMENT OF CHANGES IN GENERAL FUNDS
Year ended December 31, 1964

		Funds			
	Total	*General Working*	*General Development*	*Park Facilities Operating*	*Aquarium Development*
Balance at beginning of year..	$2,368,845.83	14,957.54	1,852,286.19	478,808.08	22,794.02
Gifts and legacies...........	2,307,866.30	–	2,307,866.30	–	–
Distribution of excess expenditures and appropriations over income for year......	(85,917.71)	(85,226.32)	(691.39)	–	–
Transfers:					
Funds functioning as endowment	105,000.00	105,000.00	–	–	–
Special purpose funds.....	(772,370.72)	(1,425.00)	(269,343.62)	(478,808.08)	(22,794.02)
Direct expenditures	(12,326.60)	–	(12,326.60) (1)	–	–
Balance at end of year.......	$3,911,097.10	33,306.22	3,877,790.88 (2) (3)	–	–

(1) Fund raising expenses of campaign office.

(2) Balance consisting of:

General uses....................................	$3,281,851.75
New York Zoological Park uses only................	103,480.00
New York Aquarium uses only.....................	600.00
Planting and landscaping in the New York Zoological Park	12,510.74
Scientific purposes only...........................	4,730.40
Marine Biological Laboratory......................	74,930.95
Wildlife Survival Center..........................	2,670.50
General capital funds.............................	108,315.74
Research Center in the New York Zoological Park......	57,810.80
African Plains project............................	100.00
Bear dens	1,000.00
World of Birds construction	175,000.00
Extension of New York Aquarium....................	54,790.00
	$3,877,790.88

(3) Not including pledges.

See accompanying notes to financial statements.

Exhibit E

STATEMENT OF CHANGES IN SPECIAL PURPOSE FUNDS

Year ended December 31, 1964

Balance at beginning of year		$ 379,624.19
Additions:		
Gifts and grants:		
U. S. Government	$ 103,528.91	
Other	206,933.76	
Investment income	17,398.13	
Gain on disposal of investments, net	2,509.73	
Transfers and appropriations:		
Operations	223,477.66	
General funds	772,370.72	1,326,218.91
		1,705,843.10
Deduct transfers to income:		
Amount equivalent to expenditures for purposes of the various funds:		
U. S. Government	88,763.42	
Other	551,169.50	
	639,932.92	
Operating costs	26,335.06	666,267.98
Balance at end of year		1,039,575.12
Consisting of:		
Cadwalader Animal fund	30,325.18	
Conservation account	13,779.17	
William E. Damon fund	51,409.22	
Grant Fund for the Protection of Wildlife	37,539.15	
Stokes Bird fund	7,675.81	
Animal fund	24,864.71	
African Wildlife fund	52,273.21	
Damon Runyon Memorial fund	152.65	
Doris Duke Foundation grant	11,796.36	
Michael Grzimek Memorial fund	100.00	
The John A. Hartford Foundation grant	73,186.73	
Improvement and repair account	5,887.86	
Henry Krumb fund	7,915.11	
Madison Grant Scientific Research fund	80,500.45	
Income from Madison Grant Scientific Research fund	7,919.94	
Park improvement account	10,449.08	
Reptile house construction fund	654.24	
African education fund	7,085.21	
National Institutes of Health Grant	2,588.51	
Carried forward	$ 426,102.59	1,039,575.12

Brought forward		1,039,575.12
Consisting of, continued:		
Brought forward	$ 426,102.59	
Wildlife survival center	70,035.85	
Scholarship loan program fund	1,476.60	
Kodiak and polar bear fund	5,021.40	
The world of birds fund	17,440.00	
The world of darkness fund	10,140.00	
Grizzly bear film fund	956.25	
Argentina photographic expedition fund	768.50	
Kangaroo house, eagle and vulture fund	2,098.44	
Park facilities operating fund	505,535.49	
		$1,039,575.12

See accompanying notes to financial statements.

NOTES TO FINANCIAL STATEMENTS

(1) Park facilities' assets are subject to an agreement with the City of New York, and the net income from park facilities' operations may be used only for the purchase of animals and the improvement of Zoological Park.

(2) The balance sheet does not include the assets and liabilities of The Pension Fund.

(3) The New York Zoological Society and the City of New York have agreed to construct an Aquarium, as funds become available, at an estimated total cost (to be shared equally) of $7,100,000.00, of which the initial stage (of approximately $1,550,000.00) was completed May 31, 1957.

(4) The Society entered into a contract on November 23, 1964 to purchase real estate adjacent to the New York Aquarium at Coney Island, Brooklyn, N. Y. at a price of $542,900.00, of which $488,610.00 remained unpaid at December 31, 1964.

PEAT, MARWICK, MITCHELL & CO.
Certified Public Accountants
Seventy Pine Street
New York, N. Y. 10005

ACCOUNTANTS' REPORT

The Board of Trustees
New York Zoological Society:

We have examined the balance sheet of New York Zoological Society as of December 31, 1964 and the related statements of income, expenditures and appropriations and changes in fund balances for the year then ended. Our examination was made in accordance with generally accepted auditing standards, and accordingly included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances. It was not practicable to confirm the receivable from the City of New York by communication with it, but we satisfied ourselves as to the account by means of other auditing procedures. As to gifts, grants and legacies, it was not practicable because of their nature to extend the examination beyond accounting, on a test basis, for the receipts as recorded.

In our opinion, the accompanying balance sheet and statements of income, expenditures and appropriations and changes in fund balances present fairly the financial position of New York Zoological Society at December 31, 1964 and the results of its operations for the year then ended, in conformity with generally accepted accounting principles applied on a basis consistent with that of the preceding year.

Peat, Marwick, Mitchell & Co.

New York, N. Y.
March 2, 1965

THE PENSION FUND

(Founded by Andrew Carnegie)

STATEMENT OF CASH TRANSACTIONS

Year ended December 31, 1964

Balance at beginning of year:			
Investments (quoted market value $2,858,995.81)			$2,353,406.99
Uninvested balance of cash			40,143.02
Accrued interest purchased			213.75
			2,393,763.76
Receipts:			
Income from investments:			
Interest		$ 53,820.00	
Dividends		62,039.38	
		115,859.38	
Contributions by employees—regular		38,181.27	
Contributions by New York Zoological Society:			
Society	$ 28,373.92		
Facilities	7,093.34		
Aquarium	6,355.28	41,822.54	
			195,863.19
			2,589,626.95
Expenditures:			
Refunds on account of resignations		4,621.07	
Pension disbursements		55,285.92	
Payments to heirs of deceased members		7,885.64	67,792.63
			2,521,834.32
Net gain on investment transactions			21,655.94

	Value			
	Quoted market	Book		
Balance at end of year:				
Investments:				
Bonds	$1,387,615.08	1,406,773.51		
Preferred stocks	228,937.50	229,344.73		
Common stocks	1,501,028.00	833,736.87		
	$3,117,580.58		2,469,855.11	
Uninvested balance of cash			73,635.15	
				$2,543,490.26

PERMANENT WILD LIFE PROTECTION FUND

December 31, 1964

ACCOUNTANTS' REPORT

THE BOARD OF TRUSTEES
NEW YORK ZOOLOGICAL SOCIETY:

We have examined the statement of the Principal Fund of the Permanent Wild Life Protection Fund for the year ended December 31, 1964, set forth below:

Amount due from New York Zoological Society		$ 7,007.21
Investments, at book value (quoted market value $242,345.75)		198,074.53
Amount of Fund at beginning of year	$ 202,435.18	
Add gain on investment transactions	2,646.56	
Principal Fund at end of year		$ 205,081.74

Our examination was made in accordance with generally accepted auditing standards, and accordingly included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances.

In accordance with the agreement establishing this Fund, the income from the investments of $9,781.25 was paid over to the New York Zoological Society to be used for the specific purposes set forth in such agreement.

In our opinion, the above statement of Principal Fund presents fairly the financial position of the Permanent Wild Life Protection Fund at December 31, 1964, in conformity with generally accepted accounting principles applied on a basis consistent with that of the preceding year. Also, in our opinion, the accompanying schedule is stated fairly in all material respects when considered in conjunction with the statement of Principal Fund.

PEAT, MARWICK, MITCHELL & CO.

New York, N. Y.
February 25, 1965

NEW YORK ZOOLOGICAL SOCIETY

Incorporation of the New York Zoological Society by the State of New York was accomplished under Chapter 435 of the Laws of 1895 and the basic purposes of the Society were embodied in Section 2:

> Said corporation shall have power to establish, maintain and control zoological parks, gardens, or other collections for the promotion of zoology and kindred subjects, and for the instruction and recreation of the people. Said corporation may collect, hold and expend funds for zoological research and publication, for the protection of wild animal life, and for kindred purposes, and may promote, form, and co-operate with other associations with similar purposes, and may purchase, sell, or exchange animals, plants, and specimens appropriate to the objects for which it was created.

Subsequently, at a special meeting of the Commissioners of the Sinking Fund, City of New York, held on March 24, 1897, a resolution was passed allotting South Bronx Park for the use of the New York Zoological Society and establishing the terms of a management agreement under which the Society has operated since that date, with only minor modifications.

The resolution of March 24, 1897, and the supplemental agreement of January 24, 1942, provided that the Society should furnish the original equipment of buildings and animals, that it should raise $250,000 by subscription within three years of the date of starting work on the improvement of the grounds, that the Society should have the right to establish an endowment fund to be used solely for the general uses and purposes of the Society unless otherwise specified by the donors, that the City of New York should provide funds for the maintenance and care of the Zoological Park and for the maintenance of the animal collections, that the Zoological Park should be open to the public free at least four days a week, that the Society may expend the net proceeds of facilities only for the purchase of animals and the improvement of the Zoological Park and that the Society should have the right to make and control all appointments of employees and to fix salaries and make promotions.

NEW YORK ZOOLOGICAL SOCIETY

Organized 1895

Presidents

I.	Andrew H. Green	1895 to 1897
II.	Levi P. Morton	1897 to 1909
III.	Henry Fairfield Osborn	1909 to 1925
IV.	Madison Grant	1925 to 1937
V.	W. Redmond Cross	1937 to 1940
VI.	Fairfield Osborn	1940

First Vice-presidents

I.	J. Hampton Robb	1895 to 1897
II.	Henry Fairfield Osborn	1897 to 1909
III.	Samuel Thorne	1909 to 1916
IV.	Madison Grant	1916 to 1925
V.	Frank K. Sturgis	1925 to 1932
VI.	W. Redmond Cross	1932 to 1937
VII.	Kermit Roosevelt	1937 to 1939
VIII.	Alfred Ely	1939 to 1959
IX.	Laurance S. Rockefeller	1959

Second Vice-presidents

I.	Charles E. Whitehead	1895 to 1902
II.	John L. Cadwalader	1902 to 1915
III.	Madison Grant	1915 to 1916
IV.	Frank K. Sturgis	1916 to 1925
V.	Henry D. Whiton	1925 to 1930
VI.	Kermit Roosevelt	1930 to 1937
VII.	Alfred Ely	1937 to 1939
VIII.	Laurance S. Rockefeller	1939 to 1959

Honorary Vice-president

I.	DeForest Grant	1957 to 1960

Treasurers

I.	L. V. F. Randolph	1895 to 1901
II.	Charles T. Barney	1901 to 1903
III.	Percy Rivington Pyne	1903 to 1922
IV.	Cornelius R. Agnew	1922 to 1953
V.	David Hunter McAlpin	1953

Secretaries

I.	Madison Grant	1895 to 1925
II.	William White Niles	1925 to 1935
III.	Fairfield Osborn	1935 to 1940
IV.	Harold J. O'Connell	1941 to 1959
V.	G. W. Merck	1959 to 1964
VI.	John Elliott	1964

Chairmen, Executive Committee

I.	Charles E. Whitehead	1895 to 1896
II.	Henry Fairfield Osborn	1896 to 1903
III.	Charles T. Barney	1903 to 1907
IV.	Henry Fairfield Osborn	1907 to 1909
V.	Madison Grant	1909 to 1937
VI.	W. Redmond Cross	1937 to 1940
VII.	Laurance S. Rockefeller	1940 to 1943
VIII.	Fairfield Osborn	1943 to 1945
IX.	Laurance S. Rockefeller	1945

Directors

I.	William T. Hornaday Zoological Park	1896 to 1926
II.	Charles H. Townsend New York Aquarium	1902 to 1937
III.	W. Reid Blair Zoological Park	1926 to 1940
IV.	Allyn R. Jennings Zoological Park	1940 to 1941
V.	Charles M. Breder, Jr. New York Aquarium	1937 to 1943
VI.	John Tee-Van Zoological Park	1952 to 1956
	General Director, Zoological Park & Aquarium	1956 to 1962
VII.	Christopher W. Coates New York Aquarium	1956 to 1964
VIII.	James A. Oliver Zoological Park	1958 to 1959
IX.	William G. Conway Zoological Park	1961
X.	Paul L. Montreuil New York Aquarium	1964

BOARD OF TRUSTEES

City of New York
Ex-officio

HON. ROBERT F. WAGNER, *The Mayor*
HON. NEWBOLD MORRIS, *Commissioner of Parks*

Class of 1965

CHARLES W. ENGELHARD
PETER GIMBEL
ROBERT G. GOELET
JOHN N. IRWIN, II
WARREN KINNEY
HOWARD PHIPPS, JR.
JOHN PIERREPONT
CHAUNCEY STILLMAN
LANDON K. THORNE, JR.

Class of 1966

ROBERT E. BLUM
WILLIAM R. COE
C. SUYDAM CUTTING
CHILDS FRICK
HENRY CLAY FRICK
OTTO MARX, JR.
DAVID HUNTER MCALPIN
G. W. MERCK
RICHARD C. PATTERSON, JR.
JOHN H. PHIPPS
ALFRED G. VANDERBILT

Class of 1967

ALEXANDER ALDRICH
GEORGE F. BAKER, JR.
JOHN ELLIOTT
ROBERT I. GANNON, S. J.
PETER GRIMM
FAIRFIELD OSBORN
EBEN PYNE
LAURANCE S. ROCKEFELLER
JOHN M. SCHIFF
HENRY SEARS
JOSEPH A. THOMAS
ROBERT WINTHROP

OFFICERS OF THE SOCIETY

Fairfield Osborn, *President*
Laurance S. Rockefeller, *First Vice-president*
John Elliott, *Secretary*
Harold C. Palmer, *Assistant Secretary*
David Hunter McAlpin, *Treasurer*
Eben Pyne, *Assistant Treasurer*
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MEMBERSHIP IN THE NEW YORK ZOOLOGICAL SOCIETY

The New York Zoological Society was founded in 1895 for the "instruction and recreation of the people" through the establishment of a Zoological Park, for the promotion of zoology through exhibition of collections, publications, research and exploration, and for the conservation of animal life of the world. Since 1899 the Zoological Society has directed the New York Zoological Park and in 1902 it was entrusted with the management of the New York Aquarium.

Membership is actively invited of all persons who are interested in the objects of the Society and desire to contribute towards its support.

Annual Membership is $15. Contributing Membership is $25. Supporting Membership is $100. These Memberships entitle the holders to Member's cards for admission (including parking) to the Zoological Park on pay days, and 5 to the Aquarium on any day; a copy of the *Annual Report;* a subscription to *Animal Kingdom,* the bi-monthly publication of the Society; privileges of the Library and Members' Lounge in the Administration Building of the Zoological Park and to attend all open meetings of the Society. Tickets to all sections of the Zoological Park for which an admission charge is made are available, free, to Members upon application at the Administration Building in person. Members will be taken on "behind the scenes" tours of the Zoological Park and Aquarium, without charge, on application, and are entitled to 20% discount on all publications of the Society. We are advised that Contributing and Supporting Membership fees are deductible from income tax within the legal limits.

Life Membership is $500. See By-laws for conversion of Annual, Contributing and Supporting to Life Membership. Other classes of membership are: Patron, $1,000; Associate Founder, $2,500; Founder, $5,000; Founder in Perpetuity, $10,000; Benefactor, $25,000.

Applications for membership may be submitted to any officer of the Society at the Zoological Park or the Aquarium, or to the Society's general office at 630 Fifth Avenue, New York, N.Y. 10020.

FORM OF BEQUEST

I do hereby give and bequeath to the "New York Zoological Society," of the City of New York...............................

....

(For purposes of the Federal income tax, contributions to the Society, including a portion of membership dues, are deductible in an amount up to 30% of the donor's adjusted gross income. Bequests to the Society are deductible for Federal estate tax purposes).

SUMMARY OF MEMBERSHIP

December 31, 1964

Benefactors	25
Founders in Perpetuity	16
Founders	16
Associate Founders	21
Patrons	71
Life Members	343
Supporting Members	175
Contributing Members	1,561
Annual Members	2,814
Fellows	71
Research Associates	3
Corresponding Members	4
Honorary Members	6
Total	5,126